Project Manual

Volume 1 of 3

Mono County Jail
Bridgeport, CA

221 Twin Lakes Road
Bridgeport, California 93517

Pre-Bid Conference:

Bid Date:

Project Number: PW-9646

Department of Public Works

BOARD OF SUPERVISORS
COUNTY OF MONO, STATE OF CALIFORNIA

N O T I C E T O B I D D E R S

Mono County Jail

221 Twin Lakes Road, Bridgeport, California 93517

Contract No. PW-9646

Sealed proposals will be received at the Mono County Clerk of the Board,

(For Fed-Ex, UPS, etc. or Hand Delivered)
Clerk of the Board of Supervisors
Annex 1, 74 North School Street
Bridgeport, CA 93517

or

(For USPS Delivery)
Clerk of the Board of Supervisors
P.O. Box 237
Bridgeport, California, 93517

until

at which time the bidding will be closed. Promptly following the closing of the bidding, all timely submitted bids will be publicly opened and read at in the Lobby on the first floor of Annex 1, 74 North School Street., for construction in accordance with the specifications thereof, to which special reference is made as follows:

MONO COUNTY JAIL

This project will construct a new stand-alone jail facility on county-owned land in Bridgeport, CA. The new jail will replace the existing jail located in downtown Bridgeport and will include housing, intake/release, and support space. Housing will consist of approximately 50 beds in multiple housing units, each with a dayroom. There will also be an outdoor recreation space. The housing area will be controlled by an adjacent central control station. Housing support will consist of program space, medical and mental health, kitchen, and laundry facilities. Staff and public support spaces include an intake area that includes in-custody holding, in-person visitation, family visitation, an isolation room, safety cell, interview space, a public lobby, video visitation, administration, a vehicle sallyport, parking space, mechanical space, electrical space, and storage. The project will also include, but is not limited to, utilities; electrical; plumbing; mechanical; heating, ventilation, and air conditioning; communications; fencing; security and fire protection systems; as well as minor landscaping and pavement for building access.

Pre-Bid Conference:
A pre-bid conference will be held at

Contractors should meet onsite at **221 Twin Lakes Road, Bridgeport, California 93517.**

Park in the dirt area, enclosed by the chain-link fence. Please do not park in front of buildings on the north side of the site.

A discussion of the project will be held and the project site will be open for examination. Attendance at the pre-bid is not mandatory; however, the scheduled pre-bid will be the only opportunity for prospective bidders to visit the site in the presence of County staff, and requests for individual site visits with County staff may not be granted. Prospective bidders may visit the site unattended.

PROJECT MANUAL

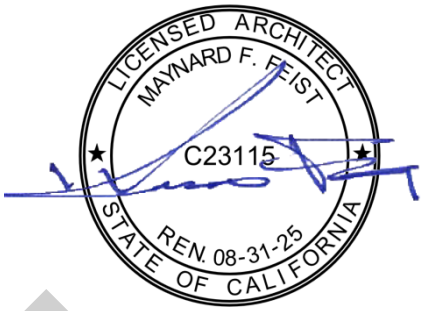
FOR

MONO COUNTY PUBLIC WORKS DEPARTMENT
MONO COUNTY NEW JAIL - NEW CONSTRUCTION

LIONAKIS JOB NO. 018133

OWNER:
MONO COUNTY PUBLIC WORKS
P.O. Box 457
Bridgeport, CA 93517
760-932-5459

ARCHITECT:
LIONAKIS
2025 19th Street
Sacramento, CA 95818
916-558-1900

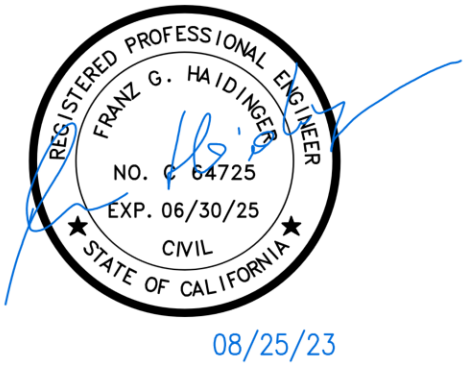


Maynard F. Feist License # C23115

STRUCTURAL ENGINEER:
LIONAKIS
2025 19th Street
Sacramento, CA 95818
916-558-1900

Darron E. Huntingdale License # S4788

CIVIL ENGINEER:
NCE
1885 S. Arlington Ave, Suite 111
Reno, NV 89509
775-329-4955



08/25/23

Franz G. Haidinger License # C64725

MECHANICAL, PLUMBING, AND
FIRE PROTECTION ENGINEER:
CAPITAL ENGINEERING CONSULTANTS, INC.
11020 Sun Center Drive, Suite 100
Rancho Cordova, CA 95670
916-851-3500

Kevin Stillman License # M33498

ELECTRICAL ENGINEER:
LP CONSULTING ENGINEERS
1209 Pleasant Grove Blvd.
Roseville CA 95661
916-771-0778

Ciprian Paduraru License # E19533

SECURITY ELECTRONICS:
LATTA TECH
1225 West 15th Street, Suite 300
Plano, TX 75075
972-633-5850

Michael J. Smith License # 38164

LANDSCAPE ARCHITECT:
KLA, INC.
151 N. Norlin Street
Sonora, CA 95370
209-532-2856

Thomas W. Holloway License # 3589

RADIO CONSULTANT:
CSI TELECOMMUNICATIONS, INC.
6 Hamilton Landing, Suite 170
Novato, CA 94949
530-746-2454

Craig Trygstad License # E14249

Agency Approval: _____

PROJECT MANUAL

FOR

MONO COUNTY PUBLIC WORKS DEPARTMENT
MONO COUNTY NEW JAIL - NEW CONSTRUCTION

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Bid Documents, Project plans and specifications

Project plans and specifications will be available for bidder download along with planholder and exchange/publication names from the Mono County Bid Management System website at **bids.monocounty.ca.gov**.

All questions regarding this project shall be in writing and shall be received by the Department of Public Works, no later than 3:00 P.M. on the tenth (10th) calendar day before bid opening. Any questions received after this deadline will not receive a response unless the Department of Public Works and Planning elects to issue an addendum to revise the bid opening date. In the event that the bid opening date is revised, the deadline for questions will be extended to no later than 2:00 P.M. on the tenth (10th) calendar day before the revised bid opening date. Questions shall be submitted on the to bids.monocounty.ca.gov

Any changes to, or clarification of, the project plans and specifications will be posted on the Bid Management System. Questions that prompt a change or clarification will be included in the addendum with the subsequent answer.

Any oral explanations or interpretations given to this project are not binding.

Bid Process

Bids are required for the entire work described herein, including bids for each of the additive alternate bids and allowance. Bids will be compared, for purposes of identifying the apparent low bidder for proposed award of the project, on the basis of the total of the base bid plus the total of the additive alternate bids and allowance; provided, however, that the ultimate scope of the project, as subsequently determined by the Board of Supervisors at the time of award, may or may not include all or any of the additive alternate bids.

Bids shall be submitted in a sealed envelope addressed to the Department of Public Works and labeled with the name of the bidder, the name of the project and the statement 'Do Not Open Until The Time Of Bid Opening.'

Upon request, bidders may receive a Summary of Bids and a list of subcontractors for the apparent low bidder, generally within 24 hours of the bid opening.

The Board of Supervisors reserves the right to reject any or all bids.

Licensing, statutory and regulatory requirements

No contract will be awarded to a contractor who has not been licensed in accordance with the provisions of the Contractors State License Law, California Business and Professions Code, Division 3, Chapter 9, as amended, or whose bid is not on the proposal form included in the contract document. A valid California Contractor's License, **Class B, General Building Contractor** is required for this project.

The Contractor and his subcontractors shall comply with all applicable statutes and regulations, and all provisions of Sections 2.51, 2.52 and 2.55 of the General Conditions, regarding payment of wages, hours of work and all other labor compliance issues.

Bonding

Bid security in the amount of ten (10) percent of the amount of the bid, and in the form of a bid bond issued by an admitted surety insurer licensed by the California Department of Insurance, cash, cashier's check or certified check shall accompany the bid. Bid security shall be made in favor of the County of Mono.

In addition to the bid bond required by law of all bidders on public works projects, the successful bidder shall furnish a faithful performance bond, a payment bond and a warranty bond in accordance with the provisions of Section 2.36 of the General Conditions.

The successful bidder shall furnish a faithful performance bond in the amount of 100 percent of the contract amount and a payment bond in the amount of 100 percent of the contract amount. Each bond specified in this Notice (bid bond, faithful performance bond and payment bond) shall meet the requirements of all applicable statutes, including but not limited to those specified in Public Contract Code section 20129 and Civil Code section 3248.

Each bond specified in this Notice shall be issued by a surety company designated as an admitted surety insurer in good standing with and authorized to transact business in this state by the California Department of Insurance, and acceptable to the County of Mono. Bidders are cautioned that representations made by surety companies will be verified with the California Department of Insurance. Additionally, the County of Mono, in its discretion, when determining the sufficiency of a proposed surety company, may require the surety company to provide additional information supported by documentation. The County generally requires such information and documentation whenever the proposed surety company has either a Best's Key Rating Guide of no less than **A** and a financial size designation of no less than **VIII**. Provided, however, that the County expressly reserves its right to require all information and documentation to which the County is legally entitled from any proposed surety company.

Pursuant to Public Contract Code Section 22300, substitution of securities for any moneys withheld by the County of Mono to ensure performance under the contract shall be permitted.

Labor Compliance

Pursuant to Section 1773 of the Labor Code, the general prevailing wage rates in the county, or counties, in which the work is to be done have been determined by the Director of the California Department of Industrial Relations. These wages are set forth in the General Prevailing Wage Rates for this project, available from the California Department of Industrial Relations' Internet web site at http://www.dir.ca.gov/DLSR/PWD. Future effective general prevailing wage rates, which have been predetermined and are on file with the California Department of Industrial Relations are referenced but not printed in the general prevailing wage rates.

This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

Except as provided in Labor Code section 1725.5(f), no contractor or subcontractor may be listed on a bid proposal for a public works project (submitted on or after March 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)].

Except as provided in Labor Code section 1725.5(f), no contractor or subcontractor may be awarded a contract for public work on a public works project (awarded on or after April 1, 2015), or engage in the performance of work on or after January 1, 2018 on any public works project (regardless of the date on which the construction contract was awarded), unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.

This contract is subject to state contract nondiscrimination and compliance requirements pursuant to Government Code, Section 12990.

Minimum wage rates for this project, as predetermined by the Secretary of Labor, are set forth in the Special Provisions. If there is a difference between the minimum wage rates predetermined by the Secretary of Labor and the Prevailing Wage Rates predetermined by the Director of the Department of Industrial Relations of the State of California for similar classifications of labor, the contractor and his subcontractors shall pay not less than the higher wage rate.

The Board of Supervisors hereby specifies that portions of the work can only be performed outside the regular working hours as defined in the applicable collective bargaining agreement filed with the Director of Industrial Relations in accordance with Labor Code Section 1773.1, and that the overtime requirements for Saturdays, and holidays are hereby waived for these portions of the work, as more particularly described in the specifications. However, this exemption shall not negate the overtime provisions specified in Labor Code Section 1815.

NOTICE TO CONTRACTORS

Certain materials, products or things shall be designated by the specific brand or trade name specified for the use on this project by the resolution referenced by Section 00 00 70 issued by the Board of Supervisors, as authorized by Public Contracts Code, Section 3400 and based on the Board's finding that such designation is required in order to match existing materials, product and things in use at existing jail facilities and other facilities within the County of Mono. The purpose of such designation is to ensure integration and compatibility of this new facility with existing systems in use at existing facilities and other facilities within the County of Mono. The interoperability of those systems with the various systems in use is a critical factor to the efficient operation and maintenance of the facility to be constructed.

Contractor is required to fill out the following "Hazardous Materials Certification" form and submit same with their bid documents:

PR0JECT: MONO COUNTY JAIL

OWNER: COUNTY OF MONO

PROJECT: PW-9646

To the Board of Supervisors, County of Mono

HAZARDOUS MATERIALS CERTIFICATION
TO BE EXECUTED BY CONTRACTOR AND SUBMITTED WITH THE SIGNED AGREEMENTS

1. The Contractor hereby certifies that no Asbestos, Asbestos-Containing Materials, poly-chlorinated biphenyl ("PCB") products, or any material listed, as of the date of Award of Construction by the Board of Supervisors, County of Mono, by any Federal and/or State Environmental Protection Agency; and/or any Federal and/or State health agencies as a hazardous material, or any other material defined as being hazardous under Federal and/or State laws, rules or regulation ("Hazardous Material"), shall be furnished, installed or incorporated in any way into the Project, or in any tools, devices, clothing or equipment used to perform any portion of the Work on the Project.

2. The Contractor further certifies that it has provided notice to and instructed its employees, subcontractors and suppliers with respect to the requirements included in paragraph 1, above, and its employees, subcontractors and suppliers have agreed to comply.

3. Asbestos and Asbestos-Containing material shall be defined as all items containing, but not limited to, chrysotile, crocidolite, amosite, anthophyllite, tremolite and actinolite. Asbestos-Containing material shall be defined as any material containing more than one-tenth of one percent (0.1%) asbestos, using recognized and accepted standardized test methods.

4. Anytime a material is suspected of meeting the definition of Hazardous Material and conclusive data does not exist to resolve the concern, the county shall engage an independent, certified, third party to sample and test the material using recognized and accepted standardized test methods. If the material is determined to be Hazardous Material, the costs of any such sampling, testing and related activities shall be borne by the Contractor.

5. All Work and/or materials found to be Hazardous Material, or Work installed with equipment containing Hazardous Material, shall be immediately rejected, removed and replaced at the Contractor's expense and at no cost to the County.

6. The Contractor has read, understands and shall comply with all the provisions contained herein.

DATE: _____

CONTRACTOR NAME: _____

SIGNATURE: _____

PRINT NAME: _____

TITLE: _____

SECTION 00 21 13 INSTRUCTIONS TO BIDDERS

1.01 EXPLANATION TO BIDDERS

An explanation desired by bidders regarding the meaning or interpretation of the drawings and specifications must be requested in writing and within ten (10) days prior to bid opening.

Oral explanations given before the award of the contract will not be binding. Any interpretation made will be in the form of an addendum to the specifications or drawings, said addendum will only be issued by the Director. A copy of the addendum will be furnished to each planholder and its receipt shall be acknowledged on the Bid Proposal.

1.02 EXAMINATION OF PLANS, SPECIFICATIONS, SPECIAL PROVISIONS AND SITE OF WORK

The bidder is required to examine carefully the site of the proposed work, the proposal, plans, specifications, special provisions and contract forms for submitting a proposal. It is mutually agreed that the submission of a proposal shall be considered prima facie evidence that the bidder has made such examination and is satisfied with the conditions to be encountered in performing the work and as to the requirements of the plan, specifications and special provisions of the contract.

1.03 PROPOSAL SECURITY

The bidder shall furnish a proposal security consisting of a bid bond, cash, certified check, or cashier's check for ten percent (10%) of the total amount bid, including additives.

In case security is in the form of a certified check or cashier's check, the Owner may make such disposition of same as will accomplish the purpose of which submitted. Checks deposited by unsuccessful bidders will be returned as soon as practicable after the bid opening.

1.04 PREPARATION OF PROPOSALS

The bidder shall prepare his proposal on the blank proposal form furnished by the Owner. The bidder shall specify a lump sum price in both words and figures for each bid item, including alternates, additives and supplemental items.

All words and figures shall be in ink. In case of a discrepancy between the prices written in words and those written in figures, the written words shall govern.

Alternate or conditional bids will not be accepted unless called for in the Special Provisions.

The bidder's proposals shall be signed in ink by the individual, by one or more partners of the partnership, or by one or more of the officers of the corporation submitting it. If the proposal is made by an individual, his name and post office address must be shown. If made by a partnership, the name of each member of the partnership must be shown. If made by a corporation, the proposal must show the name of the state under which the corporation was chartered and the name of the president, vice president, secretary and treasurer.

The required proposal security must accompany the proposal.

1.05 SUBCONTRACTORS

Every person submitting a bid to perform the work called for in the bid request shall set forth in his bid:

a. The name and the location of the place of business of each subcontractor who will perform work or labor or render service to the general contractor in or about the construction of the work or improvement in an amount in excess of one-half (1/2) of one percent (1%) of the general contractor's total bid, and

b. The portion of the work which will be done by each subcontractor.

The attention of bidders is directed to the provisions of Public Contract Code Section 4100 et seq which set forth the consequences and possible penalties which may result from a failure to comply strictly with the foregoing requirements for listing of subcontractors.

The attention of bidders is also directed to Section 1-1.16, Post-Bid/Pre-Award Information, of these Instructions to Bidders.

1.06 SUBMISSION OF PROPOSAL

Each proposal shall be submitted in a sealed envelope labeled to clearly indicate the project and contents.

All proposals shall be filed prior to the time and at the place specified in the NOTICE TO BIDDERS. Proposals received after the time for opening of the proposals will be returned to the bidder unopened.

1.07 IRREGULAR PROPOSALS

Proposals shall be considered irregular and may be rejected for the following reasons:

a. If the proposal forms furnished by the Owner are not used or are altered.

b. If there are unauthorized additions, conditional or alternate proposals or irregularities of any kind which tend to make the proposal incomplete or indefinite.

c. If the bidder adds any provision reserving the right to accept or reject an award, or to enter into a contract pursuant to an award.

d. If the bid fails to contain a price for each item.

e. Failure to comply with the provisions and instruction in the Project Manual and accompanying documents

1.08 DISQUALIFICATION OF BIDDERS

Any one or more of the following causes may be considered as sufficient for disqualification of a bidder and rejection of his proposal or proposals:

a. More than one proposal for the same work from an individual, partnership or corporation.

b. Evidence of collusion among bidders. Participants in such collusion will receive no recognition as bidders for any future work of the Owner until such participant shall have been reinstated as a qualified bidder.

c. Lack of competency and adequate machinery, plant or other equipment, as may be revealed by financial statement if required.

d. For unsatisfactory performance record as shown by past work for the Owner, judged from the standpoint of workmanship and progress.

e. Prior commitments or obligations which in the judgment of the Owner might hinder or prevent the prompt completion of the work.

f. Failure to pay, or satisfactorily settle, all bills due for labor or materials on former contracts in force at the time of letting the bid.

g. Failure to comply with any qualification regulation of the Owner.

h. Omission of proposal security.

1.09 WITHDRAWAL OR REVISION OF PROPOSALS

A bidder may, without prejudice to himself, withdraw a proposal after it has been deposited, provided the request for such withdrawal is received in writing before the time set for opening proposals. The bidder may then submit a revised proposal provided it is received prior to the time set for opening proposals.

1.10 PUBLIC OPENING OF PROPOSALS

Proposals will be opened and read publicly at the time and place indicated in the Notice to Contractors. Bidders or their authorized agents are invited to be present.

1.11 RELIEF OF BIDDER

A bidder who claims a mistake in his bid must follow the procedures in Public Contract Code Section 5100 et seq in seeking relief of his bid.

1.12 AWARD OF CONTRACT

The award of contract, if awarded, will be to the lowest responsible bidder whose proposal complies with all of the requirements prescribed. The award if made, will be within 90 days after the opening of proposals.

The right is reserved to reject any or all proposals, to waive technicalities, to advertise for new proposals, or to proceed to do this work otherwise, if in the judgment of the Owner the best interests of the Owner will be promoted thereby.

The award of the contract will be subject to the availability of funds and contingent upon approval of the State Department of Finance and SB 844 Lease Revenue Bond Financing requirements.

If the Owner finds that it will be unable to award the contract within 90 calendar days after the opening of proposals, the Owner may request that any or all bidders extend all terms of their proposal(s) to a specified date. Additional such extensions may possibly be requested. If a bidder does not elect to extend the terms of his or her proposal beyond the 120 calendar days following opening of proposals, or does not respond within 10 days to a request for an extension, that bidder's proposal will be deemed as having expired, and that bidder's proposal will not be considered for award of the contract.

Upon award, the successful bidder will be notified by letter, mailed to the address shown on the proposal. Within 10 calendar days of such notice, the Bidder shall execute the Agreement and furnish the required bonds and insurance. If a Bidder so notified by the Owner fails or refuses to execute the Agreement or to furnish required bonds and insurance within the required time, the Owner may award the Contract to another bidder or bidders or may call for new bids.

1.13 CANCELLATION OF AWARD

The awarding authority reserves the right to cancel the award of any contract at any time before the execution of said contract by all parties without any liability against the Owner.

1.14 CONTRACT BONDS

The bidder to whom award is made shall, within ten days, enter into a written contract with the Owner. The bidder shall forfeit the bid bond in case he does not follow through with the contract within ten days after the contract is awarded.

The successful bidder shall furnish a faithful performance bond in the amount of 100 percent of the contract amount and a payment bond in the amount of 100 percent of the contract amount; said bonds shall be submitted in triplicate. The successful bidder shall also furnish, in addition to the performance and payment bonds, a warranty bond in the amount equal to 10 percent of the final Contract price, secured from a surety company admitted in the State of California and satisfactory to the County. Said bond shall protect the County against the result of faulty material or workmanship and shall remain in effect for a period of one year after the date the County's Notice of Completion and is filed with the Clerk of the County of Mono.

The payment bond shall contain provisions such that if the Contractor or his subcontractors shall fail to pay (a) amounts due under the Unemployment Insurance Code with respect to work performed under the contract, or (b) any amounts required to be deducted, withheld and paid over to the Employment Development Department and to the Franchise Tax Board from the wages of the employees of the Contractor and subcontractors pursuant to Section 13020 of the Unemployment Insurance Code with respect to such work and labor, then the surety will pay these amounts. In case suit is brought upon the payment bond, the surety will pay a reasonable attorney's fee to be fixed by the court.

The contract form is attached hereto for the Contractor's information only. Execution of the contract by bidders will not be required, until after the bid award is made. Liability and Workers Compensation Insurance requirements shall be as set forth in the Agreement.

1.15 BUILDERS RISK INSURANCE

Unless otherwise provided, the Contractor shall obtain and maintain in force Builder's Risk insurance against loss or damage from all perils except earthquake. The policy shall cover the entire structure on which the work of this contract is to be done, up to the full insurable value thereof (except that if the contract is for remodeling, alteration, repair, or maintenance, then the policy shall cover the value of the contract therefore), including items of labor and materials connected therewith on the site, materials in place or to be used as part of the permanent construction including materials stored and partially paid for by the Owner as provided in Section 2.4011, surplus materials, shanties, protective fences, bridges, or temporary structures, miscellaneous materials and supplies incident to the work, and such scaffolding, stagings, towers, forms and equipment as are not owned or rented by the Contractor, the cost of which is included in the cost of the work. EXCLUDED: This insurance does not cover any tools owned by mechanics, any tools, equipment, scaffolding, staging, towers, and forms owned or rented by the Contractor, the

capital value of which is not included in the cost of the work, or any structures erected for the Contractor's administration of the project.

All subcontractors shall be insured to the extent of their portion of the work under the Contractor. The Contractor shall request, and is responsible to confirm with its insurer, that the Owner and all subcontractors are named, both as additional insured and as additional loss payees, on the Builder's Risk insurance policy. The Owner, Contractor and all subcontractors waive all rights, each against the others, for damages arising from perils covered by the insurance required under the terms of this article, except such rights as they may have to the proceeds of the Builder's Risk insurance obtained and maintained by the Contractor. The Contractor shall file a certificate of such insurance with the Owner upon issuance of the policy, and with any subcontractors upon its request.

1.16 POST-BID / PRE-AWARD INFORMATION

Within eight calendar days after bid opening, the apparent low bidder shall submit the following information to the Engineer:

a. A cost distribution of the bid, with costs shown for major items of work as defined by either the project specification index, the Uniform Construction Index (UCI)Master Format, or other method as appropriate for the project and approved by the Engineer.

b. The cost distribution shall distinguish between work to be done by the bidder's own forces and work that will be subcontracted (including those who are to furnish materials or equipment fabricated to a special design); all subcontractors shall be named, regardless of the dollar amount of subcontracted work. Bidders' attention is also directed to California Public Contract Code Section 4100 et seq regarding subcontracting.

c. Any qualification statement, list of projects, or other material required by specification documents for the purpose of evaluating the competency and qualifications of either the apparent low bidder, or the listed subcontractors and suppliers. Such qualification statements may be in addition to statements required to be submitted with the proposal. Such qualification statements shall be supplemented with additional material, if required by the Engineer.

d. The Engineer reserves the right to reject any proposed subcontractor, installer, or supplier who cannot show satisfactory evidence of meeting the qualifications required by the specification documents. In the event of such rejection, the apparent low bidder shall, within five working days, submit the name and qualifications of a replacement subcontractor, installer or supplier satisfactory to the Engineer. Such replacement submittal shall be in accordance with all specification requirements.

e. No adjustment of bid prices shall be made in the event of such replacement. This information may be used in the evaluation of bids. If the project is awarded, the cost distribution will be used in determining amounts payable on progress payments and final payment.

The Engineer may request that bidders other than the apparent low bidder submit similar cost distribution or qualification information, for the purpose of evaluating bids.

Upon completion of the bid evaluation process, cost distributions or qualification information submitted by other than the apparent low bidder will be returned upon request.

The attention of each prospective bidder is directed to the requirements of article 3.18 of the Supplemental General Conditions, entitled ‘Escrow Bid Documents.”

BIDDERS' CHECKLIST (CAPITAL IMPROVEMENT PROJECTS)

The following checklist is offered for the bidders' information and use in preparing the proposal. This checklist is not to be considered as part of the contract documents. Bidders are cautioned that deleting or not submitting a form supplied in the bid documents (even if the form does not require signature) may result in an irregular bid.

PROPOSAL (Section 00 42 13)

Bidder name on each sheet. Price for each item. Price for additive, deductive, supplemental or alternate items. Make no additions such as "plus tax", "plus freight", or conditions such as "less 2% if paid by 15th". Use ink or typewriter. Acknowledge addenda.

BID SECURITY FORM (00 43 13)

Indicate type of bid security provided.
Provide contractor license information.

State business name and if business is a:

Corporation - list officers
Partnership - list partners
Joint Venture - list members; if members are corporations or partnerships, list their officers or partners.
Individual - list Owner's name and firm name style

Signature of Bidder - Bid Must Be Signed!

Corporation - by an officer
Partnership - by a partner
Joint Venture - by a member
Individual - by the Owner
If signature is by a Branch Manager, Estimator, Agent, etc., the bid must be accompanied by a power of attorney authorizing the individual to sign bids, otherwise the bid may be rejected.

Business Address - Firm's Street Address

Mailing Address - P.O. Box or Street Address

Bid Security shall be ten percent (10%) of the total bid amount (to include supplemental or additive items).

Type of Bid Security:

Cash - Not recommended; cash is deposited in a clearing account and is returned to bidders by County warrant. This process may take several weeks.

Cashier's or Certified Checks - Will be held until the bid is no longer under consideration. If submitted by a potential awardee, they will be returned when the contract bonds are submitted and approved.

Bid Bonds - Must be signed by the bidder and by the attorney-in-fact for the bonding company. Signature of attorney-in-fact should be notarized and the bond should be accompanied by bonding company's affidavit authorizing attorney-in-fact to execute bonds. An unsigned bid bond will be cause for rejection.

SUBCONTRACTOR LIST (Section 00 43 36 to 00 43 36)

One firm for each type of work to be subcontracted. Fill out as completely as possible. Name, location and description of work is required.

NON COLLUSION AFFIDAVIT (Section 00 45 19)

Must be completed, signed, and returned with bid.

OTHER

Make sure your bid envelope is sealed and shows the project name.

If you hand deliver your bid to a County employee, confirm that they are an employee of the Clerk/Recorders office. Other employees may be unfamiliar with the procedures for handling bids.

If you mail your bid, allow time for postal/courier delay. Bids not in the County's PO Box, or in the possession of the Clerk/Recorder after the set time will be returned unopened. Be sure the statement "Do Not Open Until Time of Bid Opening", is on the envelope.

End of Section 00 22 13

PROPOSAL

COUNTY OF MONO

Facility: **Mono County Jail**

Work to be performed: The Work includes construction of a 25000 square foot Jail in conformance with all Local, state, and federal requirements and codes including, but not limited to: General Conditions, temporary facilities, site preparation, Parking, driveways, demolition, utilities, concrete, steel, masonry, metals, casework, thermal moisture protection, doors and windows, hardware, finishes, equipment, specialties, Mechanical, Plumbing, Electrical, fire suppression, fire alarm, CCTV surveillance, telecommunications, Direct Digital Control system, kitchen, laundry as shown on the Plans, in conformance with the Specifications and as included in these contract documents.

Building No.: 1

Address: **221 Twin Lakes Road, Bridgeport, CA 93517**

Project No.: PW-9646

In case of a discrepancy between words and figures, the words shall prevail.

If this proposal shall be accepted and the undersigned shall fail to contract, as aforesaid, and to give the three bonds in the sums to be determined as aforesaid, with surety satisfactory to the Awarding Authority, within ten (10) days after the award of the contract, the Awarding Authority, at its option, may determine that the bidder has abandoned the contract, and thereupon this proposal and the acceptance thereof shall be null and void, and the forfeiture of such security accompanying this proposal shall operate and the same shall be the property of the Owner.

The undersigned, as bidder declares that all Addenda issued with respect to this bid have been received and incorporated into this Proposal. The bidder's signature on this Proposal also constitutes acknowledgement of all addenda.

The undersigned, as bidder, declares that the only persons, or parties interested in this proposal as principals are those named herein; that this proposal is made without collusion with any other person, firm or corporation; that he has carefully examined the location of the proposed work, the annexed proposed form of contract, and the plan therein referred to; and he proposes and agrees if this proposal is accepted, that he will contract with the County of Mono to provide all necessary machinery, tools, apparatus and other means of construction, and to do all the work and furnish all the materials specified in the contract in the manner and time therein prescribed, and according to the requirements of the Engineer as therein set forth, and that he will take in full payment therefore the following lump sum price, to-wit:

BIDDER:_____

Project: MONO COUNTY JAIL	
Work consists of: All work shown on the Plans and listed in the Project Manual and all work needed for the project to be complete and functional for its intended purpose, including but not limited to General Conditions, Demolition, Extension of existing on-site utilities, Grading, Site Work, Irrigation, Concrete, Masonry, Metals, Architectural Wood Work, Thermal and Moisture Protection, Doors and Windows, Hardware, Finishes, Equipment, Specialties, Mechanical, Plumbing, Fire Suppression, Fire Alarm, Vandal Alarm, CCTV Surveillance, Electrical, Telecommunications, Audio-Visual, and Direct Digital Control System, Electronics.	
Total bid written in words:	**Total in numerals** **$_____.**

PROJECT: MONO COUNTY JAIL

Project No.: PW-9646

Accompanying this proposal is security (check one only) in amount equal to at least ten percent (10%) of the total amount of the bid:

[ ]Bid Bond; [ ]Certified Check; [ ]Cashier's Check; [ ]Cash = $_____

The names of all persons interested in the foregoing proposal as principals are as follows:

IMPORTANT NOTICE: If bidder or other interested person is a corporation, state legal name of corporation, also names of the president, secretary, treasurer and manager thereof; if a co-partnership, state true name of firm, also names of all individual co-partners composing firm; if bidder or other interested person is an individual, state first and last name in full.

FIRM NAME _____

Licensed in accordance with an act providing for the registration of Contractors,

Class _____ License No._____ Expires _____

(Furnishing Contractor License information as part of this proposal is optional and is requested to facilitate verification of licensure)

_____ _____

Signature of Bidder Dated

NOTE: If bidder is a corporation, the legal name of the corporation shall be set forth above together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation; if bidder is a co-partnership, the true name of the firm shall be set forth above together with the signature of the partner or partners authorized to sign contracts on behalf of the co-partnership; and if bidder is an individual, his signature shall be placed above. If signature is by an agent, other than an officer of a corporation or a member of a partnership, a Power of Attorney must be on file with the Owner prior to opening bids or submitted with the bid; otherwise, the bid will be disregarded as irregular and unauthorized.

BUSINESS ADDRESS: _____
Zip Code
MAILING ADDRESS: _____
Zip Code

BUSINESS PHONE: (_____)_____ FAX NUMBER: (_____)_____

End of Section 00 43 13

PROJECT: MONO COUNTY JAIL

Project No: PW-9646

BIDDER:_____

SUBCONTRACTORS

The following named subcontractor(s) will perform with labor, or otherwise render services to the general contractor in or about the construction of the work or improvement in an amount in excess of **one-half of one percent** of the total bid presented herewith. Please fill out as completely as possible when submitting your bid. Use subcontractor's business name style as registered with the License Board. Submission of subcontractor's name, location of business and description of work is REQUIRED, by Section 4104 of the California Public Contract Code, to be submitted prior to bid opening. (The "location of business" must specify the city in which the subcontractor's business is located, and the state if other than California.) All other requested information shall be submitted, either with the bid or within 24 hours after bid opening.

Failure to list subcontractors as required may result in a penalty being assessed against the awarded Prime Contractor in accordance with the provisions of Section 4110 of the California Public Contract Code.

Use the following form to list all subcontractors. Attach additional pages as needed.____

_____

PROJECT: MONO COUNTY JAIL

Project No: PW-9646

BIDDER:_____

SUBCONTRACTOR:

Item No. or Description of Work: _____

Dollar Amount and Percentage of Total Bid: _____

Business Address:

Class _____ License No.:_____

_____

SUBCONTRACTOR:

Item No. or Description of Work: _____

Dollar Amount and Percentage of Total Bid: _____

Business Address:

Class _____ License No.:_____

PROJECT: MONO COUNTY JAIL

Project No: PW-9646

BIDDER:_____

PROJECT: MONO COUNTY JAIL

Project No: PW-9646

To the Board of Supervisors, County of Mono:

N O N C O L L U S I O N A F F I D A V I T

TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID *

_____
(Printed or Typed Name)

being first duly sworn, deposes and says that he or she is

_____
(Owner, Partner, Corporate Officer (list title), Co-Venturer)

of _____
(Bidding Entity)

the party making the foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

_____ _____
(Signature) (Dated)

(Title 23 United States Code Section 112)

(Calif Public Contract Code Section 7106; Stats.1988, c. 1548, Section 1.)

* NOTE: Completing, signing, and returning the Noncollusion Affidavit is a required part of the Proposal. Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution.

End Section 00 45 19

PROJECT: MONO COUNTY JAIL
PROJECT No: PW-9646

CERTIFICATION WITH REGARD TO THE PERFORMANCE OF PREVIOUS CONTRACTS OR SUBCONTRACTS SUBJECT TO THE EQUAL OPPORTUNITY CLAUSE AND THE FILING OF REQUIRED REPORTS.

The following certification is required by the Equal Employment Opportunity Regulations of the Secretary of Labor (41 CFR 60-1.7(b) (1), and must be submitted by bidders and proposed subcontractors only in connection with contracts and subcontracts which are subject to the equal opportunity clause. Contracts and subcontracts which are exempt from the equal opportunity clause are set forth in 41 CFR 60-1.5. (Generally only contracts or subcontracts of $10,000 or under are exempt.)

Currently, Standard Form 100 (EEO-1) is the only report required by the Executive Orders or their implementing regulations.

Proposed prime contractors and subcontractors who have participated in a previous contract or subcontract subject to the Executive Orders and have not filed the required reports should note that 41 CFR 60-1.7(b) (1) prevents the award of contracts and subcontracts unless such contractor submits a report covering the delinquent period or such other period specified by the Director, Office of Federal Contract Compliance, U. S. Department of Labor.

Use the following form to provide the necessary certification. Attach additional forms for each subcontractor.

PROJECT: MONO COUNTY JAIL
PROJECT No: PW-9646

CERTIFICATION WITH REGARD TO THE PERFORMANCE OF PREVIOUS CONTRACTS OR SUBCONTRACTS SUBJECT TO THE EQUAL OPPORTUNITY CLAUSE AND THE FILING OF REQUIRED REPORTS.

The _____ <*bidder name*> *or* proposed subcontractor, _____ <*subcontractor name*>*,* hereby certifies that he/she *has/has not* participated in a previous contract or subcontract subject to the equal opportunity clause, as required by Executive Orders 10925, 11114, or 11246, and that he <has *or* has not> filed with the Joint Reporting Committee, the Director of the Office of Federal Contract Compliance, a Federal Government contracting or administering agency, or the former President's Committee on Equal Employment Opportunity, all reports due under the applicable filing requirements.

_____
(Company)

By: _____

_____
(Title)

Date: _____

A G R E E M E N T

THIS AGREEMENT made the _____ day of _____, at Bridgeport, in Mono County, California, by and between _____, hereinafter called the Contractor, and the County of Mono hereinafter called the Owner.

WITNESSETH: That the Contractor and the Owner, for the consideration hereinafter named, agree as follows:

ARTICLE I. The Contractor agrees to furnish all labor and materials, including tools, implements, and appliances required, and to perform all the work in a good and workmanlike manner, free from any and all liens and claims of mechanics, material men, subcontractors, artisans, machinists, teamsters, draymen and laborers required for the completion of the:

MONO COUNTY JAIL

Located at, Bridgeport, California, all in strict compliance with the plans, drawings and specifications therefore prepared by the Director of the Mono County Department of Public Works and his authorized representatives, hereinafter called the Engineer, and other contract documents relating thereto.

ARTICLE II. The Contractor and the Owner agree that the Advertisement (Notice to Contractors), the Wage Scale, the Proposal hereto attached, the Instructions to Bidders, the General Conditions and Supplemental General Conditions of the contract, the Specifications, the Drawings and the Addenda and Bulletins thereto, the Contract Bonds and Certificates of Liability and Workers Compensation Insurance, and the Contract Change Orders, together with this Agreement, form the Contract Documents, and they are as fully a part of the contract as if hereto attached or herein repeated. The specifications and drawings are intended to cooperate so that any work exhibited in the drawings and not mentioned in the specifications, or vice versa, is to be executed the same as if both are mentioned in the specifications and set forth in the drawings, to the true intent and meaning of the said drawings and specifications when taken together. But no part of said specifications that is in conflict with any portion of this Agreement, or that is not actually descriptive of the work to be done thereunder, or of the manner in which the said work is to be executed, shall be considered as any part of this Agreement, but shall be utterly null and void, and anything that is expressly stated, delineated or shown in or upon the specifications or drawings shall govern and be followed, notwithstanding anything to the contrary in any other source of information or authority to which reference may be made.

ARTICLE III. The Contractor agrees that the work under the contract shall be completed as determined by the Owner within from the date shown in the Notice to Proceed. Time of performance shall be deemed as of the essence hereof and it is agreed that actual damages to the owner from any delay in completion beyond the date provided for herein, or any extension thereof until the work is completed or accepted, shall be all provable damages plus liquidated damages in the amount of Two Thousand Five Hundred dollars ($2,500) per day; that said liquidated damage was arrived at by a studied estimate of loss to the Owner in the event of a delay considering the following damage items which are extremely difficult or impossible to determine: Additional

construction expense resulting from delay of completion including, but not limited to, engineering, inspection, rental and utilities; provided, however, the Owner may conditionally accept the work and occupy and use the same if there has been such a degree of completion as shall in its opinion render the same safe, fit and convenient for the use for which it is intended and in such cases the Contractor and Surety shall not be charged for liquidated damages for any period subsequent to such conditional acceptance and occupation by the Owner but Owner may assess actual damages caused by failure of total completion during such period. The time during which the Contractor is delayed in said work by the acts or neglects of the Owner or its employees or those under it by contract or otherwise, or by the acts of God which the Contractor could not have reasonably foreseen and provided for, or by storms and inclement weather which delays the work, or by any strikes, boycotts, or like obstructive action by employee or labor organizations, or by any general lockouts or other defensive action by employers, whether general, or by organizations of employers, shall be added to the time for completion as aforesaid.

ARTICLE IV. The Owner agrees to pay the Contractor in current funds for the performance of the contract, the price bid for the Project on the Proposal Forms, and to make payments on account thereof as provided in the General Conditions.

ARTICLE V. The Contractor and the Owner agree that changes in this Agreement or in the work to be done under this Agreement shall become effective only when written in the form of a supplemental agreement or change order and approved and signed by the Owner and the Contractor. It is specifically agreed that the Owner shall have the right to request any alterations, deviations, reductions or additions to the contract or the plans or specifications or any of them, and the amount of the cost thereof shall be added to or deducted from the amount of the contract price aforesaid by fair and reasonable valuations thereof.

And this contract shall be held to be completed when the work is finished in accordance with the original plans and specifications as amended by such changes. No such change or modification shall release or exonerate any surety upon any guaranty or bond given in connection with this contract.

ARTICLE VI. In the event of a dispute between the Owner or Engineer and the Contractor as to an interpretation of any of the specifications or as to the quality of sufficiency of material or workmanship, the decision of the Engineer shall for the time being prevail and the Contractor, without delaying the job, shall proceed as directed by the Engineer without prejudice to a final determination by negotiation, arbitration by mutual consent or litigation and should the Contractor be finally determined to be either wholly or partially correct, the Owner shall reimburse him for any added costs he may have incurred by reason of work done or material supplied beyond the terms of the contract as a result of complying with the Engineer's directions as aforesaid. In the event the Contractor shall neglect to prosecute the work properly or fail to perform any provisions of this contract, the Owner, after three days' written notice to the Contractor, may, without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due to the Contractor, subject to final settlement between the parties as in this paragraph hereinabove provided.

ARTICLE VII. If the Contractor should be adjudged a bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he or any of his subcontractors should persistently violate any of the provisions of the contract, or if he should persistently or repeatedly refuse or should fail, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper material, or if he should fail to make prompt payment to subcontractors or for material or labor or persistently disregard laws, ordinances or the instructions of the Engineer, then the Owner may, upon the certificate of the Engineer, when sufficient cause exists to justify such action, serve written notice upon the Contractor and his surety of its intention to terminate the contract, such notice to contain the reasons for such intention to terminate the contract, and unless within five days after the serving of such notice, such violations shall cease and satisfactory arrangements for correction thereof be made, the contract shall, upon the expiration of said five days, cease and terminate.

In the event of any such termination, the Owner shall immediately serve written notice thereof upon the surety and the Contractor, and the surety shall have the right to take over and perform the contract, provided, however, that if the surety within ten (10) days after the serving upon it of notice of termination does not give the Owner written notice of its intention to take over and perform the contract or does not commence performance thereof within the ten (10) days stated above from the date of the serving of such notice, the Owner may take over the work and prosecute the same to completion by contract or by any other method it may deem advisable for the account and at the expense of the Contractor, and the Contractor and his surety shall be liable to the Owner for any excess cost occasioned the Owner thereby, and in such event the Owner may without liability for so doing, take possession of and utilize in completing the work, such materials, appliances, plant and other property belonging to the Contractor as may be on the site or the work and necessary therefore. In such case, the Contractor shall not be entitled to receive any further payment until the work is finished.

If the unpaid balance of the contract price shall exceed the expense of finishing the work, including compensation for additional managerial and administrative services, such excess shall be paid to the Contractor. If such expense shall exceed such unpaid balance, the Contractor shall pay the difference to the Owner. The expense incurred by the Owner as herein provided, and damage incurred through the Contractor's default, shall be certified by the Engineer.

ARTICLE VIII. The Contractor and his subcontractors shall comply with Sections 1770 – 1780 of the California Labor Code and the provisions of Sections 2.52 and 2.55 of the General Conditions concerning the payment of wages to all workers and mechanics, and the employment and payment of apprentices by the Contractor or any subcontractor for all work performed on the Project.

ARTICLE IX. The Contractor and his subcontractors shall comply with Sections 1810 to 1815 of the California Labor Code and the provisions of Section 2.51 of the General Conditions, concerning hours of work and payment of overtime compensation for all work performed on the Project.

ARTICLE X. To the fullest extent permitted by law, Contractor agrees to and shall indemnify, save, hold harmless and at County's request, defend County and its officers, agents and employees, and the Engineer and Construction Manager and their respective officers, agents and employees, from any and all costs and expenses,

attorney fees and court costs, damages, liabilities, claims and losses occurring or resulting to County, the Engineer or Construction Manager in connection with the performance, or failure to perform, by Contractor, its officers, agents or employees under this Agreement, and from any and all costs and expenses, attorney fees and court costs, damages, liabilities, claims and losses occurring or resulting to any person, firm or corporation who may be injured or damaged by the performance, or failure to perform, of Contractor, its officers, agents or employees under this Agreement. In addition, Contractor agrees to indemnify County for Federal, State of California and/or local audit exceptions resulting from non-compliance herein on the part of Contractor.

In any and all claims against the County, the Engineer or Construction Manager, or any of their respective officers, agents or employees, initiated by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation set forth in the immediately preceding paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workmen's compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE XI. Without limiting the Owner's right to obtain indemnification from Contractor or any third parties, Contractor, at its sole expense, in accordance with the provisions of Section 2.40 of the General Conditions, shall maintain in full force and effect the following insurance policies throughout the term of this Agreement, excepting only those policies for which a longer term is specified:

A. Course of Construction (Builder's All Risk) Insurance, with scope and amount of coverage as specified in Section 2.40 E.1 of the General Conditions.

B. Commercial General Liability Insurance, with scope and amount of coverage as specified in Section 2.40 E.2 of the General Conditions.

C. Automobile Liability Insurance, with scope and amount of coverage as specified in Section 2.40 E.2 of the General Conditions.

D. Professional Liability Insurance, with scope and amount of coverage as specified in Section 2.40 E.3 of the General Conditions.

E. Worker's Compensation Insurance, with scope and amount of coverage as specified in Section 2.40 E. 4 of the General Conditions.

The Certificate of Insurance shall be issued in triplicate, to the COUNTY OF MONO, and all other participating agencies, whether or not said agencies are named herein, who contribute to the cost of the work or have jurisdiction over areas in which the work is to be performed and all officers and employees of said agencies while acting within the course and scope of their duties and responsibilities.

ARTICLE XII. The Contractor represents that he has secured the payment of Workers Compensation in compliance with the provisions of the Labor Code of the State of California and Paragraphs B.3, C.3 and E.4 of Section 2.40 of the General Conditions,

and that he will continue so to comply with such statutory and contractual provisions for the duration and entirety of the performance of the work contemplated herein.

This Contract, PW-9646 was authorized by the Board of Supervisors
It has been reviewed by the Department of Public Works and is in proper order for signature by the County.

Mono County:	Contractor:
_____	_____
Signture	Signature
_____	_____
Title	Title

_____
County Counsel

_____
Risk Management

End Section 00 52 13

PROJECT: MONO COUNTY JAIL

PROJECT NO: PW-9646

(This guarantee shall be executed by the successful bidder in accordance with Article 2.32 of the General Conditions. The bidder may execute the guarantee on this page at the time of submitting his bid.)

GUARANTEE

To the Owner: County of Mono

The undersigned guarantees the construction and installation of the following work included in this project:

ALL WORK

Should any of the materials or equipment prove defective or should the work as a whole prove defective, due to faulty workmanship, material furnished or methods of installation, or should the work or any part thereof fail to operate properly as originally intended and in accordance with the plans and specifications, due to any of the above causes, all within twelve (12) months unless noted otherwise in contract documents after the date on which this contract is accepted by the Owner, the undersigned agrees to reimburse the Owner, upon demand, for its expenses incurred in restoring said work to the condition contemplated in said project, including the cost of any such equipment or materials replaced and the cost of removing and replacing any other work necessary to make such replacement or repairs, or, upon demand by the Owner, to replace any such material and to repair said work completely without cost to the Owner so that said work will function successfully as originally contemplated.

The Owner shall have the unqualified option to make any needed replacement or repairs itself or to have such replacements or repairs done by the undersigned. In the event the Owner elects to have said work performed by the undersigned, the undersigned agrees that the repairs shall be made and such materials as are necessary shall be furnished and installed within a reasonable time after the receipt of demand from the Owner. If the undersigned shall fail or refuse to comply with his obligations under this guarantee, the Owner shall be entitled to all costs and expenses reasonably incurred by reason of said failure or refusal.

_____
(Company)

By:_____

_____
(Title)

Date:_____

2.01 IDENTIFICATION OF CONTRACT

A. The Agreement shall be signed by the Contractor and the Owner.

B. The Contract Documents are defined in ARTICLE II of the Agreement.

C. The Contract Documents form the Contract for Construction. This Contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification as defined above. The Contract Documents shall not be construed to create any contractual relationship of any kind between the Architect or Engineer and the Contractor, but the Architect or Engineer shall be entitled to performance of the obligations of the Contractor intended for their benefit and to enforcement thereof. Nothing contained in the Contract Documents shall create any contractual relationship between the Owner and any Subcontractor or Sub-subcontractor.

2.02 EXECUTION, CORRELATION, AND INTENT OF CONTRACT DOCUMENTS

A. The Contract Documents are complementary and anything called for by one shall be supplied as if called for by all, providing it comes clearly within the scope of the Contract.

B. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work. Work not covered in the Contract Documents will not be required unless it is consistent therewith and is reasonably inferable therefrom as being necessary to produce the intended results. Words and abbreviations that have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings.

C. Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with the local conditions under which the Work is to be performed, and has correlated personal observations with the requirements of the Contract Documents.

D. All work and material shall be the best of the respective kinds specified or indicated. Should any workmanship or materials be required that are not directly or indirectly called for in the Contract Documents, but which nevertheless are necessary for proper fulfillment of the obvious intent thereof, said workmanship or materials shall be the same for similar parts that are detailed, indicated or specified, and the Contractor shall understand the same to be implied and provide for it in his/her tender as if it were particularly described or delineated.

2.03 OWNERSHIP AND USE OF DOCUMENTS

All Contract Documents and copies thereof furnished shall remain the property of the Owner. With the exception of one (1) contract set for each party to the Contract, such documents are to be returned by Contractor or suitably accounted for to the Owner on request at the completion of the Work. Submission or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's common law copyright or other reserved rights. The Owner's use of the documents will not increase the Architect's design liability beyond the Project and the site for which the design was originally intended.

2.04 DEFINITIONS

The following words, or variations thereof, as used in these documents have meanings as defined:

A. The Work - The Work comprises the completed construction required of the Contractor by the Contract Documents, and includes all labor, materials, equipment and services necessary to produce such construction, and all materials, other permits and equipment incorporated or to be incorporated in such construction.

B. The Project –

This project will construct a new stand-alone jail facility on county-owned land in Bridgeport, CA. The new jail will replace the existing jail located in downtown Bridgeport and will include housing, intake/release, and support space. Housing will consist of approximately 50 beds in multiple housing units, each with a dayroom. There will also be an outdoor recreation space. The housing area will be controlled by an adjacent central control station. Housing support will consist of program space, medical and mental health, kitchen, and laundry facilities. Staff and public support spaces include an intake area that includes in-custody holding, in-person visitation, family visitation, an isolation room, safety cell, interview space, a public lobby, video visitation, administration, a vehicle sallyport, parking space, mechanical space, electrical space, and storage. The project will also include, but is not limited to, utilities; electrical; plumbing; mechanical; heating, ventilation, and air conditioning; communications; fencing; security and fire protection systems; as well as minor landscaping and pavement for building access.

Upon completion the building will consist of a single-story masonry structure that will include two 10 bed dormitory rooms, two 11 bed high security dayrooms, one 4 bed dormitory room, Ad-Seg and Isolation rooms. The building will have a vehicle sallyport connected to Inmate processing, Administration areas and industrial kitchen. The building will be approximately 21,758 square feet and located adjacent to the existing County occupied buildings on County-owned land east of Twins Lake Road in Bridgeport, CA. This project site is located at 221 Twin Lakes Road, Bridgeport, CA 93517.

Project includes all work shown on the Contract specifications and drawings, work includes, but is not limited to:, temporary facilities, site preparation, demolition, on-site utilities, concrete, steel, masonry, metals, casework, thermal moisture protection, doors and windows, hardware, finishes, equipment, specialties, Mechanical, Plumbing, Electrical, fire

suppression, fire alarm, CCTV surveillance, telecommunications and direct digital control system.

C. Owner - The County of Mono, in the State of California, as represented by the Mono County Board of Supervisors and so named in the Agreement. The term Owner means the Owner or the Owner's authorized representative for this project.

D. Construction Manager (CM) – The authorized representative of the Owner, as defined in Section 2.04C, in all aspects of administering the contract on behalf of the Owner.

E. Inspector of Record (IOR) - The person assigned by Owner to perform Quality Assurance inspection of the Work (also sometimes referred to as Project Inspector or Owner's Inspector or Owner's Project Inspector).

F. Architect or Engineer – The Owner and his/her authorized representatives, as defined in Section 2.04C, or a duly licensed Architect and/or Engineer providing consultant services in accordance with an agreement with the Owner.

G. Contractor - When used in the General Conditions refers to person(s) or entity (partnership or corporation) so named in Agreement and when used in the body of the Specifications, refers to the Contractor for that specific work, whether it be the General Contractor, Subcontractor, or other Contractor. The term Contractor means the Contractor or the Contractor's authorized representative.

H. Subcontractor - Person, persons, entity, co-partnership or corporation having direct contract with Contractor to perform any of the Work at the site (i.e. a second-tier, third-tier or lower-tier Subcontractor. The term Subcontractor means a Subcontractor or a Subcontractor's authorized representative. The term Subcontractor does not include any separate contractor or any separate contractor's subcontractors.

I. Sub-subcontractor – Person, persons, entity, co-partnership or corporation having a direct or indirect contract with a Subcontractor to perform any of the Work at the site. (The term Sub-subcontractor means a Sub-subcontractor or an authorized representative thereof.)

2.05 SPECIFICATIONS AND DRAWINGS

A. Precedence – Anything mentioned in the Specifications and not shown on the Drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. Subject to Article 2.02, in cases of discrepancy concerning dimension, quantity and location, the Drawings shall take precedence over the Specifications. Explanatory notes on the Drawings shall take precedence over conflicting drawn indications. Large scale details shall take precedence over smaller scale details and figured dimensions shall take precedence over scaled measurement. Where figures are not shown, scale measurements shall be followed but shall in all cases be verified by measuring actual conditions of Work already in place. In cases of discrepancy concerning quality and application of materials and non-technical requirements over materials, the specifications shall take precedence over Drawings.

B. Division of Specifications - For convenience of reference and to facilitate the letting of independent contracts, this specification may be separated into certain sections; such separation shall not operate to oblige the Owner, Architect or Engineer or Professional Consultant to establish the limits of any contract between the Contractor and Sub-Contractor each of whom shall depend upon his/her own contract stipulations. The General Conditions apply with equal force to all work, including extra work.

C. Governing Factors - Dimensions figured on drawings shall be followed in every case in preference to scale of drawings.

D. Discrepancies - Should the Contractor, at any time, discover a discrepancy in a drawing or specification, or any variation between dimensions on drawings and measurements at site, or any lacking of dimensions or other information, he/she shall report at once to the CM requesting clarification and shall not proceed with the work affected thereby until such clarification has been made. If the Contractor proceeds with work affected by such discrepancies, without having received such clarification, he/she does so at his/her own risk. Any adjustments involving such circumstances made by the Contractor, prior to approval by the IOR, shall be at the Contractor's risk and the settlement of any complications or disputes arising therefrom shall be at the Contractor's sole expense and Contractor shall indemnify, hold harmless and defend Owner, Owner's representatives, and CM from any liability or loss with respect to said adjustments.

E. Scope of Drawings - The drawings shall be held to determine the general character of the Work as well as its details. Parts not detailed shall be constructed in accordance with best standard practice for work of this class, so as to afford the requisite strength and logically complete the parts they compose. Where it is obvious that a drawing illustrates only a part of a given work or of a number of items, the remainder shall be deemed repetitious and so construed. The Contractor shall be responsible for all errors made in using any drawings which have been superseded.

F. Shop Drawings, Product Data and Samples –

1) Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or any Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work. Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work. Samples are physical examples that illustrate materials, equipment or workmanship, and establish standards by which the work will be judged.

2) The Contractor shall be required to purchase Prolog Converge software for administration of Shop Drawings, Product Data and Samples. The Contractor will be required to purchase as many licenses as needed for the Contractor's use plus, at the Contractor's discretion, any additional licenses as may be needed by his subcontractors.

3) The Contractor shall prepare, review, approve and submit to the CM, with reasonable promptness and in such sequence as to cause no delay in the Work or in the work of the Owner or any separate contractor, all Shop Drawings, Product Data and Samples required by the Contract Documents.

4) By preparing, approving and submitting Shop Drawings, Product Data and Samples, the Contractor represents that the Contractor has determined and verified all materials, field measurements and field construction criteria related thereto, or will do so with reasonable promptness, and has checked and coordinated the information contained within such submittals with the requirements of the Work, the Project and the Contract Documents.

5) The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Architect's review of Shop Drawings, Product Data or Samples, unless the Contractor has specifically informed the CM in writing of such deviation at the time of submission and the Architect has reviewed the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data or Samples by the Architect's review of them.

6) When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the Architect shall be entitled to rely upon the accuracy and completeness of such calculations and certifications. The cost of such certifications shall be borne by the Contractor. Owner may elect to have an independent certification performed at its own expense. The Owner shall have final approving authority for performance-based items.

7) The Contractor shall direct specific attention, in writing or on resubmitted Shop drawings, Product Data, or Samples, to revisions other than those requested by the Architect on previous submittals.

8) No portion of the Work requiring submission of a Shop Drawing, Product Data or Sample shall be commenced until the submittal has been reviewed by the Architect. All such portions of the Work shall be in accordance with reviewed submittals.

9) Submission of Shop Drawings and Samples to the CM is required for only those items specifically mentioned in the Specification Sections. If Contractor submits Shop Drawings for items other than the above, the CM will not be obligated to distribute or review them. Contractor shall be responsible for the procuring of Shop Drawings for his/her own use as he/she may require for the progress of the Work.

10) The term "Shop Drawings" as used herein also includes but is not limited to fabrication, erection, layout and setting drawings, manufacturer's standard drawings, descriptive literature, catalogs, brochures, performance and test data, wiring and control diagrams, all other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment or systems and the positions and layout of each conform to the Contract requirements. As used herein the term

"manufactured" applies to standard units usually mass-produced, and the term "fabricated" means items specifically assembled or made out of selected materials to meet individual design requirements. Shop Drawings shall establish the actual detail of all manufactured or fabricated items; indicate proper relation to adjoining work; amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure; and incorporate minor changes of design or construction to suit actual conditions.

11) Drawings: Following Contractor's review and approval, Contractor shall be required to utilize Procore software for administration of drawings. The CM will check the submittal to see if it is complete. If complete, the CM will forward the Drawings to the Owner and the Architect. The Architect and Owner will check the Drawings, note Architect and Owner comments, affix a stamp to the Drawings indicating the status of acceptance, and will process the Drawings through Prolog Converge back to all parties. The Architect or his/her consultants, as applicable, will review the Shop Drawings; and indicate with the affixed stamp; “Reviewed”, “Reviewed – Additional Information Required”, “Furnish as Corrected”, “Revise and Resubmit”, or “Rejected. The Contractor shall then print and distribute the appropriate number of copies to his/her job personnel as required. If a drawing is stamped “Rejected” or “Revise and Resubmit”, the Contractor shall correct and resubmit as outlined above. When stamped “Furnish as Corrected”, or similar instructions, the Contractor shall correct and resubmit electronic files for record only. Also see Technical Specifications, Division 1, General Requirements, Section 01 33 23 - Submittal Procedures.

12) Samples: Following Contractor's review and approval, he/she shall submit to the Architect or Engineer, four (4) samples of all materials in quantities and sizes as specified herein. Submittals shall be given to the Architect or Engineer at a time determined by the Contractor, which allows for any necessary resubmittal and which will not cause any delay in the Work. Samples will be forwarded to the Architect. If a sample is stamped “Rejected” or “Revise and Resubmit”, one sample so noted will be returned to the Contractor. The Contractor shall correct and resubmit as outlined above. If a sample is stamped "Make Corrections Noted", one sample so noted will be returned. Corrected samples shall be resubmitted for approval as per the original submittal. Also see General Requirements Section 01 33 23.

13) Product Data: Following Contractor's review and approval, he/she shall submit Product Data to the Architect or Engineer through Prolog Converge. Corrected copies shall be resubmitted through Prolog Converge for approval as per the original submittal. Also see General Requirements Section 01 33 23.

14) Manufacturer's Instructions: Where any item or work is required by Specifications to be furnished, installed or performed in accordance with a specified product manufacturer's instructions, Contractor shall procure and distribute the necessary copies of such instructions to all concerned parties.

G. Materials - All materials, unless otherwise specified, shall be new and of good quality, proof of which shall be furnished by the Contractor; in case of doubt as to kind or quality required, samples shall be submitted to the Architect/Engineer through the Architect or Engineer who

will specify the kind and use of the material appropriate to the location and the function of the item in question and Contractor shall furnish such accordingly. Before final payment, all material rejected by the Architect or Engineer or Architect shall be promptly removed from the premises by the Contractor, whether or not completely installed, and promptly and properly replaced with correct materials, including any other work adjoining if disturbed, in accordance with the contract and without expense to the Owner; the Contractor also shall pay for work of other Contractors as is affected by such removals and replacements.

2.06 THE ARCHITECT

A. The Architect advises the CM in all aspects of the construction phase of the Project. His/Her functions include advice and assistance to the CM in the correct interpretation and application of the Contract Documents. The Architect is not authorized independently to issue Addenda, Clarifications, Field Orders, Work Authorizations, or Change Orders, or in any other way to bind the Owner in discussions with the Contractor.

B. The Contractor shall deliver all correspondence relating to the proper execution of the Work to the CM. The CM reserves the right to consult with the Architect and Owner prior to responding to the Contractor's correspondence.

C. When discussions between the Contractor and the CM occur either on the site or elsewhere, but the Architect is not present, the CM reserves the right to consult with the Architect and Owner prior to issuing his/her final decision or instruction.

D. The Architect shall review or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for conformance with the design concept of the Work and the information given in the Contract Documents. Such action shall generally be taken within ten (10) working days, however under certain circumstances such as very complex submittals or if a large number of submittals are submitted at one (1) time it may take longer. In this case the Contractor will be notified and given the opportunity to advise the Engineer and Architect of priorities. The Architect's review of a specific item shall not indicate review of an assembly of which the item is a component.

2.07 CONSTRUCTION MANAGER

A. The CM is the authorized representative of the Owner in all aspects of administering the construction contract on behalf of the Owner. All communications from and to the Contractor will be channeled through the CM. However, the CM does not have the authority to bind the Owner in matters affecting adjustments to the time or cost of the project as defined in the Agreement for Construction.

B. The CM will be the Owner's representative during the construction and until final payment to all contractors is due. The CM will advise and consult with the Owner. All instructions to the Contractor shall be forwarded through theCM. The CM will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise

modified by written instrument. The County's Director of Public Works be the Owner's representative during the warranty periods.

C. The CM will be on site during construction to monitor the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. On the basis of on-site observations and communication with the Contractor, the CM will keep the Owner informed of the progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work of the Contractor.

D. The CM shall at all times have access to the Work wherever it is in preparation and progress. The Contractor shall provide facilities for such access so that the CM may perform its functions under the Contract Documents.

E. Based on the CM's observations, and an evaluation of the Contractor's Application for Payment, the CM will determine the amount owing to the Contractor and will issue to the Owner Certificates for Payment incorporating such amount.

F. The CM will be the initial interpreter of the requirements of the Contract Documents and the initial judge of the performance hereunder by the Contractor. The Owner will have final authority of all such matters.

G. The CM will render interpretations necessary for the proper execution or progress of the Work, with reasonable promptness and in accordance with agreed upon time limits. Either party to the Contract may make written request to the CM for such interpretations.

H. Claims, disputes and other matters in question between the Contractor and the CM relating to the execution or progress of the Work or the interpretation of the Contract Documents shall be referred to the Owner (or his/her designee).

I. All interpretations and decisions of the CM will be in writing or in graphic form, and shall be both consistent with the intent of the Contract Documents and reasonably inferable therefrom.

J. The CM will have the authority to reject, or recommend to the Owner the rejection, of any work that does not conform to the Contract Documents. Whenever, in the CM's opinion, it is considered necessary or advisable for the implementation of the intent of the Contract Documents, the CM will have authority to require special inspection or testing of the Work whether or not such work be then fabricated, installed or completed.

K. The CM will receive from the Contractor and review all Shop Drawings, Product Data and Samples, and forward same to Architect and Owner for review.

L. Following consultation with the Owner, the CM will take appropriate action on Change Orders, and will have authority to order minor changes in the Work as provided herein.

M. The CM will conduct inspections to determine the date of Completion, and will receive and forward to the Owner for the Owner's review written warranties and related documents required by the Contract Documents and assembled by the Contractor. The CM will issue a

final Project Certificate for Payment upon compliance with the requirements for completion and final payment. The County Department of General Services will monitor the warranty for a period of one (1) year, unless otherwise specified as a longer term.

N. The duties, responsibilities and limitations of authority of the CM as the Owner's representatives during construction as set forth in the Contract Documents, will not be modified or extended without written consent of the Owner, the Contractor and the CM, which consent shall not be unreasonably withheld. Failure of the Contractor to respond within ten (10) days to a written request shall constitute consent by the Contractor.

O. In case of the termination of the employment of the CM, the Owner may appoint a successor CM, whose status and duties under the Contract Documents shall be the same as those of the former CM.

P. The Inspector of Record (IOR) shall act as an agent for the County at the project site with respect to compliance with code, plans, specifications and quality assurance required of a public works Project. The IOR shall issue correction and stop work notices and notify the CM and County in writing if work does not conform to contract documents. The responsibilities of the IOR shall not relieve the Contractor of compliance with the Contract documents, codes and regulations.

2.08 OWNER

A. Information and Services Required of the Owner

1. Unless otherwise provided in the Contract Documents, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for the construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

2. Information or services under the Owner's control shall be furnished by the Owner with reasonable promptness to avoid delay in the orderly progress of the Work.

3. The Owner shall forward all instructions to the Contractor through the CM.

B. Owner’s Right to Stop the Work

If the Contractor fails to correct defective work as required by Article 2.42 or persistently fails to carry out the Work in accordance with the Contract Documents, the Owner, by a written order signed personally or by an agent specifically so empowered by the Owner in writing, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the Owner to stop the Work shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of any contractor or any other person or entity, except to the extent required by Article 2.12.C.

C. Owner’s Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, and fails after written notice from the Owner to correct such default or neglect with diligence and promptness, the Owner may, after an additional written notice and without prejudice to any other remedy the Owner may have, make good such deficiencies. In such case an appropriate Change Order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the additional services of the Architect or other professionals made necessary by such default, neglect or failure. Such action by the Owner and the amount charged to the Contractor are both subject to the prior approval of the Architect or Engineer. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner, or Owner may require payment by the surety on the performance or warranty bonds as appropriate. Such action shall, in no way, affect the status of either party under contract, nor be held as a basis of any claim by the Contractor for damages or extension of time.

2.09 CONTRACTOR RESPONSIBILITIES

A. Review of Contract Documents and Field Conditions

1. The Contractor shall carefully study and compare the Contract Documents and shall at once report to the CM any discrepancy or inconsistency that may be discovered. The Contractor shall not be liable to the Owner or the CM for any damage resulting from any such inconsistencies or discrepancies in the Contract Documents unless the Contractor recognized such inconsistencies or discrepancies and knowingly failed to report it to the CM. The Contractor shall perform no portion of the Work at any time unless authorized by the Contract Documents or, where required, approved Shop Drawings, Product Data or Samples for such portion of the Work.

2. Neither the Owner nor the CM or Architect assume any responsibility for an understanding or representation made by any of their agents or representation prior to the execution of the Agreement unless (1) such understanding or representations are expressly stated in the Agreement, and (2) the Agreement expressly provides that responsibility therefore is assumed by the Owner.

3. Failure by the Contractor to acquaint himself/herself with all available information will not relieve him/her from responsibility for estimating properly the difficulty or cost of successfully performing the Work.

4. The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Any inconsistencies or discrepancies discovered by the Contractor shall be reported to the CM at once.

5. Before submitting any Request for Information (RFI), or other contractor initiated request for information, the Contractor shall determine that the information requested is not clearly provided in the Contract Documents. RFI's shall be submitted to the CM only

from the Contractor, or Owner, and not from any subcontractor, supplier or other vendor, and shall be on a form approved by the CM. The Contractor shall provide a revised and updated RFI Priority Schedule on a weekly basis. The RFI Priority Schedule shall rank RFI's in order of priority and include a brief statement of reason for priority. Owner initiated RFI's will not be listed on the Contractor's RFI Priority Schedule. The Owner will provide the Architect or Engineer a separate list of Owner initiated RFI's upon request of the Architect or Engineer. The Architect or Engineer will endeavor to respect the order of priorities as requested by the Contractor or Owner for the overall benefit of the Project. The RFI process is for information and clarification only and may not be utilized to obtain approval for changes in Contract price or time. Also see Division 1 - General Requirements.

B. Supervision Procedures

1. The Contractor shall efficiently supervise and direct the Work, using therein the Contractor's best skill and diligence for which he/she is remunerated in the contract price. He/She shall carefully inspect the site and study and compare the Contract Documents, as ignorance of any phase of any of the features or conditions affecting the Contract will not excuse him/her from carrying out its provisions to its full intent.

2. The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the project site during the progress of the Work. The superintendent shall represent the Contractor and all communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be so confirmed upon written request in each case. The Superintendent who begins the project shall remain on the project until the project is completed, as long as the Contractor employs that person. The Superintendent shall not be replaced without the approval of the Owner.

3. The Contractor shall be responsible to the Owner for the acts and omissions of his/her employees, subcontractors and their agents and employees, and other persons performing any of the Work under a contract with the Contractor.

4. The Contractor shall at all times enforce strict discipline and good order among his/her employees and shall not employ on the Work any unfit person or anyone not skilled in the task assigned to him/her.

5. The Contractor shall not be relieved from his/her obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the Owner or the Architect or Engineer in his/her administration of the Contract, or by inspections, tests or approvals required or performed by persons other than the Contractor.

C. Construction Procedures

1. Means and Methods - The Contractor shall be solely responsible for and control of construction means, methods, techniques, sequences, coordination and procedures for

all the Work of this contract. Additionally, he/she shall be responsible for safety precautions and programs in connection with the Work.

2. Laws of County and State - The Contractor must comply with all rules, regulations and ordinances of the County in which the Work is being done, and all State laws pertaining to the Work.

3. Safeguards - The Contractor shall provide, in conformity with all local codes and ordinances and as may be required, such temporary walls, fences, guard-rails, barricades, lights, danger signs, enclosures, etc., and shall maintain such safeguards until all work is completed.

4. Housekeeping - Contractor shall keep the premises free of excess accumulated debris. Clean up as required and as directed by the Architect or Engineer. At completion of work all debris shall be removed from the site. Refer to General Requirements for additional requirements.

5. Labor and Materials - Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

6. The Contractor shall deliver to the Architect or Engineer, prior to final acceptance of the Work as a whole, signed certificates from suppliers of materials and manufactured items stating that such items conform to the Contract Documents.

7. The Contractor, immediately upon Notice to Proceed (or where shop drawings, samples, etc., are required, immediately upon receipt of review thereof) shall place orders for all materials, work fabrication, and/or equipment to be employed by him/her in that portion of the Work contracted for. The Contractor shall keep all materials, work fabrications and/or equipment specified and shall advise the Architect or Engineer promptly, in writing, of all orders placed and of such materials, work fabrications and/or equipment which may not be available in a timely manner for the purposes of the Contract.

8. Any worker whose work is unsatisfactory to the Owner or the Architect or Engineer, or are considered by the Owner or Architect or Engineer to be careless, incompetent, unskilled or otherwise unfit shall be dismissed from work under the Contract upon written request to the Contractor from the Owner or the Architect or Engineer.

2.10 SUBCONTRACTORS

A. Agreements - Agreements between the Contractor, Subcontractors, and Subcontractors of lower tier shall be subject to the approval of the Owner, but in no case does such approval relieve the Contractor of any conditions imposed by the Contract Documents. The Contractor shall only use subcontractors included in his/her sealed bid unless first approved

by the Owner pursuant to statute. The Contractor shall not use any subcontractor who is ineligible to perform work on a Public Works Project pursuant to section 1777.1 or 1777.7 of the Labor Code. Notwithstanding any other provision of the Contract Documents, subcontractors may be added, deleted or substituted only in accordance with the provisions of Public Contract Code Section 4100 et seq.

B. Relation with Subcontractor – By an appropriate agreement, written where legally required for enforceability, the Contractor shall bind every Sub-Contractor and every Subcontractor agrees to be bound by the terms of the Contract Documents to carry out their provisions insofar as applicable to their work; and the Contractor further agrees to pay to each Subcontractor promptly upon issuance of Certificate of Payment, his/her or their due portion. Said agreement shall preserve and protect the rights of the Owner and the Architect or Engineer under the Contract Documents with respect to the work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the Contractor-Subcontractor Agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, under the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with their Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the Subcontract, copies of the Contract Documents to which the Subcontractor will be bound by this Paragraph and identify to the Subcontractor any terms and conditions of the proposed Subcontract which may be at variance with the Contract Documents. Each Subcontractor shall similarly make copies of Contract Documents available to their Sub-subcontractors. Nothing contained herein shall be deemed to create an agency relationship between the Owner and any Subcontractor or material supplier.

C. Owner's Relation - Neither the acceptance of the name of Subcontractor nor the suggestion of such name nor any other act of the Owner or Architect or Engineer nor anything contained in any Contract Document is to be construed as creating any contractual relation between the Owner (or Owner’s authorized representatives) and any Subcontractor of any tier nor as creating any contractual relation between the Architect or Engineer and any Subcontractor of any tier.

D. All Subcontractors employed by the Contractor shall be appropriately licensed in conformity with the laws of the State of California.

E. Jurisdictional disputes between Subcontractors or between Contractor and Subcontractor shall not be mediated or decided by the Owner, Architect or the Architect or Engineer. The Contractor shall be responsible for the resolution of all such disputes based upon his/her contractual relationship with his/her Subcontractors.

2.11 OWNER'S RIGHT TO PERFORM WORK AND TO AWARD SEPARATE CONTRACTS

A. The Owner reserves the right to perform work related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or

other work on the site under these or similar Conditions of the Contract. If the Contractor claims that the Owner's action results in delay, damage or additional cost attributable thereto, the Contractor shall make such claim as provided elsewhere in the Contract Documents.

B. When separate contracts are awarded for different portions of the Project or other work on the site, the term Contractor in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

C. The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

D. Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights which apply to the Contractor under the Conditions of the Contract.

2.12 MUTUAL RESPONSIBILITY

A. The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

B. When any part of the Contractor's Work depends upon proper execution or results of the work of the Owner or any separate contractor, the Contractor shall, prior to proceeding with the Work, promptly report to the Architect or Engineer any apparent discrepancies or defects in such other work that render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acceptance of the Owner's or separate contractor's work as fit and proper to receive the Work, except as to defects which may subsequently become apparent in such work by others.

C. If, following the reporting of any discrepancy or defect as required herein above, the Contractor suffers damage due to disruption or delay caused by the separate contractor, without fault by the Owner, the Contractor's remedy shall be limited to seeking recovery from the separate contractor.

D. Any costs caused by defective or ill-timed work shall be borne by the Contractor responsible therefor.

E. Should the Contractor cause damage to the work or property of the Owner, or to other work or property on the site, the Contractor shall promptly remedy such damage as provided herein.

F. Should the Contractor wrongfully delay or cause damage to the work or property of any separate contractor, the Contractor shall, upon due notice, promptly attempt to settle with such other contractor by agreement, or otherwise to resolve the dispute. If such separate contractor sues the Owner on account of any delay or damage alleged to have been caused by the Contractor, the Owner shall notify the Contractor who shall defend such proceedings, and if any judgment or award against the Owner (or Owner's authorized representatives) arises therefrom, the Contractor shall pay or satisfy such judgment or award in full and shall reimburse the Owner for all costs which the Owner has incurred in connection with such matter.

2.13 OWNER'S RIGHT TO CLEAN UP

If a dispute arises between the Contractor and separate contractors as to their responsibility for cleaning up as required in the Contract Documents, the Owner may clean up and the contractor responsible therefor shall pay Owner such portions of the cost thereof as the IOR shall determine to be just.

2.14 GOVERNING LAW

The Contract shall be governed by the law of the State of California.

2.15 INSPECTION

A. All material and workmanship (if not otherwise designated by the Contract Documents) shall be subject to inspection, examination, and test by the Owner and IOR at any and all times during manufacture and/or construction and at any and all places where such manufacture and/or construction are carried on. The Owner and IOR shall have the right to reject defective material and workmanship or require its correction.

B. The Contractor shall furnish promptly without additional charge, all reasonable facilities, labor, and materials necessary for the safe and convenient inspection and tests that may be required by the Owner and IOR.

C. Where the Contract Documents, instructions by the Owner, laws, ordinances, or any public authority having jurisdiction requires work to be inspected, tested or approved before work proceeds, such work shall not proceed, nor shall it be concealed prior to inspection.

D. The Contractor shall give the IOR at least two (2) days advance notice of the readiness for any Contract compliance inspection by the Inspector. The Contractor shall give notice as required by all other inspecting and testing agencies of jurisdiction for Code and regular compliance inspection. In all cases, the Contractor shall schedule inspections so as not to delay the Work.

E. If the IOR determines that any work requires additional special inspection beyond that identified in the specifications, the IOR will, upon written authorization from the Owner, instruct the Contractor to order such special inspection, testing or approval, and the Contractor shall give notice as provided above. If such special inspection or testing reveals a failure of the Work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the IOR's additional services, testing or inspections made necessary by such failure; otherwise the Owner shall bear such costs, and an appropriate Change Order shall be issued.

F. Should it be considered necessary or advisable by the IOR at any time either before acceptance of the entire Work or after acceptance and within the warranty period to make an examination of work already completed, by removing or tearing out same, the Contractor shall on request promptly furnish all necessary facilities, labor, and material. If such work is found to be defective in any material respect, due to the fault of the IOR or his/her Subcontractors, he/she shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, the actual cost of labor and material necessarily involved in the examination and replacement, plus fifteen percent (15%), shall be allowed the Contractor and he/she shall, in addition, if completion of the work has been delayed thereby, be granted a suitable extension of time on account of the additional work involved.

G. Required certificates of inspection, testing or approval shall be secured by the Contractor and the Contractor shall promptly deliver them to the Construction Manager for review and evaluation of compliance with the appropriate specifications and standards.

H. When the work is completed the Contractor shall notify the IOR in writing that the work will be ready for final inspection and test on a definite date which shall be stated in such notice.

2.16 TAXES, PERMITS, FEES, AND INDEMNIFICATION FOR PATENT INFRINGEMENT CLAIM

A. The Contractor shall pay for and include all Federal, State and local taxes direct or indirect for the work or portions thereof provided by the Contractor which are legally enacted at the time bids are opened, whether or not yet enacted, and take out and pay all fees and charges for permits and licenses, unless otherwise specified in Supplemental General Conditions or Technical Specifications of these specifications.

B. Royalty and license fees incidental to the use of any patented material, device or process shall be paid by the Contractor and in the event of a claim of alleged infringement of patent copyright, or Trade Secret rights, the Contractor shall indemnify, save the Owner (and Owner's authorized representatives) free and harmless, and defend, at the Contractor's own expense, any and all suits that may be brought in such connection.

C. Unless otherwise provided in the Contract Documents, the Owner shall secure and pay for the building permit, permanent utility connection fees, and right-of-way encroachment permit. The Contractor shall secure and pay for temporary construction utilities, and all other permits and governmental fees, licenses and inspections necessary for the proper execution and completion

of the Work which are customarily secured after execution of the Contract and which are legally required at the time bids are opened. Contractor shall be reimbursed by County for “actual” costs for permits obtained for Project.

D. The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the performance of the Work.

E. It is not the responsibility of the Contractor to make certain that the Contract Documents are in accordance with applicable laws, statutes, building codes and regulations. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, the Contractor shall promptly notify the IOR in writing, and any necessary changes shall be accomplished by appropriate Modification.

F. If the Contractor performs any work knowing it to be contrary to any laws, ordinances, rules and regulations, without notice to the IOR, the Contractor shall assume full responsibility therefore and shall bear all costs attributable thereto.

G. Any reference in the Contract Documents to codes, standard specifications or manufacturer's instructions shall mean the latest printed edition of each in effect at the Contract date.

2.17 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Within thirty (30) calendar days after receipt of Notice to Proceed, the Contractor shall submit a Construction Schedule in CPM (Critical Path Method) form to the CM for approval. The Construction Schedule shall be sufficiently detailed to accurately depict all the work required by the Contract. CPM Construction Schedule shall reflect shop drawings; submittals due and return dates, fabrication and delivery times, cost loading, crew mix, and equipment loading data. The Contractor shall thereafter adhere to the Construction Schedule, as updated monthly, or as necessary in accordance with the Contract Documents including any scope changes, or changes in the work approved by the Owner during the course of construction. "Slack" or "float" time on the CPM Construction Schedule is neither for the sole benefit of the Owner or Contractor.

B. Within fourteen (14) calendar days after the pre-construction conference, the Contractor shall provide a Submittal and Procurement Schedule indicating time periods for review of Shop Drawings, Data, Samples, and procurement of material and equipment required for the Work. Contractor shall allow time for submittal review in accordance with the General Requirements Section – Construction Progress Documentation. All items that require review by the CM and/or are not readily available from stock and requiring more than thirty-five (35) days lead-time shall be included in the Submittal and Procurement Schedule. Items listed in the Submittal and Procurement Schedule shall also be identified as activities on the CPM Construction Schedule. Contractor shall identify items requiring coordination with work of separate contractors. The working day to calendar date correlation shall be based upon the Contractor’s proposed work week with adequate allowance for legal holidays, days lost due to abnormal weather, and any special requirements of the Project.

C. The Construction Schedule shall be prepared and maintained by the Contractor.

D. The Owner, CM, Contractor and other Contractor(s) shall jointly review the progress of the work weekly. Should this review, in the opinion of the CM, indicate that the work is behind the schedule established by currently reviewed Construction Schedule, the Contractor shall either (1) provide a plan to the IOR indicating the steps the Contractor intends to take in order to recover the time behind schedule and conform to the reviewed Construction Schedule; or (2) submit a revised Construction Schedule for completion of the work, remaining within the contract completion time, to the CM for review by the next weekly meeting. If the Contractor's recovery or revised schedule requires work to occur after normal working hours or on other than normal working days, the Contractor will be responsible for any resulting costs incurred by the Owner, including but not limited to, the costs for construction management, contract administration, inspection, testing and staffing.

E. The Contractor shall deliver copies of his/her daily job logs to the CM and Owner on a weekly basis. At a minimum, the Contractor's daily job log should include the sub-contractors working onsite, number of workers and their trade classification, description of work, visitors, temperature and weather conditions, accidents, delays, and any other important information pertaining to the project that day. The Contractor will schedule and coordinate the Work of all sub-contractors on the Project. The Contractor will keep the Sub-contractors informed of the Construction Schedule to enable the Contractor to plan and perform the Work properly.

2.18 RECORDS, DOCUMENTS AND SAMPLES AT THE SITE

A. The Contractor shall maintain all records of required Review Agencies, County or State inspections and shall promptly notify the Architect or Engineer of the results of any inspection. Copies of all such records shall be provided to the Owner.

B. The Contractor shall secure and maintain required certificates of inspection, testing or approval and shall promptly deliver them to the Architect or Engineer.

C. The Contractor shall maintain at the Project site, on a daily basis, one (1) record copy of all Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record all changes made during construction, and reviewed Shop Drawings, Product Data and Samples. These shall be available to the CM, IOR and the Owner and reviewed weekly, and shall be delivered to the CM for forwarding to the Owner upon completion of the Project. The Contractor shall advise the CM on a current basis of all changes in the Work made during construction. Payment may be withheld from Contractor for failure to maintain current Record Documents.

2.19 USE OF SITE

A. The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents, and shall not unreasonably encumber the site with any materials or equipment.

B. The Contractor shall coordinate all of the Contractor's operations with, and secure approval from, the CM before using any portion of the site. Also see Technical Specifications, Division 1, General Requirements.

2.20 CUTTING AND PATCHING OF WORK

A. The Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the Work or to make its several parts fit together properly.

B. The Contractor shall not damage or endanger any portion of the Work or the work of the Owner or any separate contractors by cutting, patching or otherwise altering any work, or by excavation. The Contractor shall not cut or otherwise alter the work of the Owner or any separate contractor except with the written consent of the Owner and of such separate contractor. The Contractor shall not unreasonably withhold from the Owner or any separate contractor consent to cutting or otherwise altering the Work.

C. In all cases exercise extreme care in any cutting operations and perform such operations under adequate supervision by competent mechanics skilled in the applicable trade. Openings shall be neatly cut and shall be kept as small as possible to avoid unnecessary damage. Careless and/or avoidable cutting damage, etc., will not be tolerated, and the Contractor will be held responsible for such avoidable or willful damage.

D. All replacing, patching and repairing of all materials and surfaces cut or damaged in the execution of the Work shall be performed by experienced mechanics of the several trades involved. All work of such nature shall be done with the applicable materials, in such a manner that all surfaces so replaced, repaired, or patched, will, upon completion of the Work, match the surrounding similar surfaces.

2.21 CLEANING UP

A. The Contractor shall at all times keep the premises free from accumulation of waste materials or rubbish caused by the Contractor's operations. At the completion of the Work, the Contractor shall remove all the Contractor's waste materials and rubbish from and about the Project as well as all the Contractor's tools, construction equipment, machinery and surplus materials.

B. If the Contractor fails to clean up at the completion of the Work, the Owner may do so and the cost thereof shall be paid by the Contractor.

2.22 INDEMNIFICATION

A. To the fullest extent permitted by law, Contractor agrees to and shall indemnify, save, hold harmless and at Owner’s request, defend Owner and its officers, agents and employees, and the Architect and Consultants and their respective officers, agents and employees, from any and all costs and expenses, attorney fees and court costs, damages, liabilities, claims and losses occurring or resulting to Owner, the Architect or Consultants in connection with the

performance, or failure to perform, by Contractor, its officers, agents or employees under this Agreement, and from any and all costs and expenses, attorney fees and court costs, damages, liabilities, claims and losses occurring or resulting to any person, firm or corporation who may be injured or damaged by the performance, or failure to perform, of Contractor, its officers, agents or employees under this Agreement. In addition, Contractor agrees to indemnify Owner for Federal, State of California and/or local audit exceptions resulting from non-compliance herein on the part of Contractor.

B. In any and all claims against the Owner, the Architect or Consultants, or any of their respective officers, agents or employees, initiated by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation set forth in the immediately preceding paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workmen's compensation acts, disability benefit acts or other employee benefit acts.

2.23 FAIR EMPLOYMENT PRACTICES CLAUSE

Nondiscrimination: In connection with the performance of Work under the contract, the Contractor agrees (as prescribed in Chapter 6 of Division 3 of Title II of the Government Code of the State of California, commencing at Section 12900 and by Labor Code Section 1735) not to discriminate against any employee or applicant for employment because of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, marital status or sex. The aforesaid provisions shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Contractor agrees to post hereafter in conspicuous places, available for employees and applicants for employment, Notices to be provided by the County, setting forth the provisions of this discrimination clause. The Contractor further agrees to insert the foregoing provisions in all subcontracts hereunder, except subcontracts for standard commercial supplies of raw materials.

2.24 PAYMENT

A. CONTRACT SUM

The Contract Sum is stated in the Owner-Contractor Agreement and, including authorized adjustments thereto, is the total amount payable by the Owner to the Contractor for the performance of the Work under the Contract Documents.

B. SCHEDULE OF VALUES

Before the first Application for Payment, the Contractor shall submit to the CM a Schedule of Values allocated to the various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Architect or Engineer may require. This schedule, unless objected to by the CM, shall be used only as a basis for the Contractor's Applications for Payment. The Contractor shall be required to provide a "separate" Schedule of Values" for

each of the Work Areas and accepted additive alternate bid items referenced in Exhibits A and B of Section 00 21 13, Instructions to Bidders.

C. APPLICATIONS FOR PAYMENT

The Owner will make progress payments to the Contractor upon completion of portions of the Work, as covered by the Contract Documents, in accordance with established Owner procedures. The Contractor shall be required to submit a “separate” Application for Payment for each of the Work Areas noted in Exhibits A and B of Section 00 21 13, Instructions to Bidders.

1. On or about the twentieth (20th) of the month in which the work was performed, the Contractor shall submit to the CM an itemized Application for Payment for each of the Work Areas, notarized if required, supported by such data substantiating the Contractor's right to payment as the Owner or the CM may require, including appropriate updates to the Construction Schedule, and reflecting retainage, if any, as provided elsewhere in the Contract Documents. Payment is expressly conditioned upon submission by the Contractor of conditional and unconditional waivers and release of lien rights upon progress payment as the Owner or the Architect or Engineer may require. Waiver and Release forms must be submitted on forms approved by the Owner. Copies of said forms shall comply with Civil Code §§ 8132 through 8138, inclusive.

2. Unless otherwise provided in the Contract Documents, payments may be made on account of materials or equipment not incorporated in the Work but delivered and suitably stored at the site and, if approved in advance by the Owner, payments may similarly be made for materials or equipment suitably stored at some other location agreed upon in writing. Payments for materials or equipment stored on or off the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials or equipment or otherwise protect the Owner's interest, including applicable insurance and transportation to the site for those materials and equipment stored off the site.

3. The Contractor warrants that title to all work, materials and equipment covered by an Application for Payment will pass to the Owner either by incorporation in the construction or upon receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, stop notices, claims, security interest or encumbrances, hereinafter referred to as "liens"; and that no work, materials or equipment covered by an Application for Payment will have been acquired by the Contractor, or by any other person performing work at the site or furnishing materials and equipment for the Project, subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such other person.

4. On or about the twentieth (20th) day of the month following the month in which the work was performed, the Owner shall pay to the Contractor ninety-five percent (95%) of the value of said work in place, as checked and approved by the CM. The balance of five percent (5%) of the estimate shall be retained by the Owner until the time of final acceptance of said

work. In lieu of the five percent (5%) retainage, the Contractor may substitute securities as provided herein below.

i. If the Owner does not pay the Contractor within thirty (30) days after receipt of an undisputed and properly submitted payment request for a progress payment, excluding that portion of the final payment designated by the contract as retention earnings, then the Owner shall pay interest to the Contractor as provided by Public Contract Code § 20104.50. Said interest penalty is the sole recourse of Contractor and Contractor shall have no right to stop the Work until payment of the amount owing has been received, nor shall the Contract Time be extended, nor shall the Contract Sum be increased in any way, including by reason of any costs incurred by Contractor, except to the extent of said interest payment.

ii. Pursuant to Public Contract Code § 7107, in the event of a dispute between the Owner and Contractor, the Owner may withhold from the final payment an amount not to exceed one hundred and fifty percent (150%) of the disputed amount. Except as so provided, the Owner shall release the retention withheld within sixty (60) days after the date of completion of the work of improvement, as "completion" is defined in Public Contract Code § 7107. In the event that retention payments are not made within the time periods required by Public Contract Code § 7107, the Owner may be subject to the interest provisions of Public Contract Code § 7107.

5. Security Substitutions and Escrow for Moneys Withheld to Insure Contractor's Performance. Pursuant to Public Contract Code section 22300, the Contractor may deposit in an escrow, equivalent securities for any moneys withheld to insure performance and have said moneys paid directly to Contractor, or, in the alternative, have the Owner deposit such moneys directly into an escrow. Upon the closing of any such escrow, Contractor shall pay to each Subcontractor, not later than twenty (20) days after receipt of the closing payment, the respective amount of interest earned, net of costs attributed to retention withheld from each Subcontractor, on the amount of retention withheld to insure the performance of the Contractor. Any escrow established pursuant to this article shall be with a state or federally chartered bank, shall be at the sole expense of the Contractor, and shall be established using an escrow agreement in substantially the following form:

(Begin Escrow Agreement)

ESCROW AGREEMENT FOR SECURITY DEPOSITS IN LIEU OF RETENTION

This Escrow Agreement is made and entered into by and between the County of Mono, (hereinafter called "Owner"), _____ (hereinafter called "Contractor"); and _____, a state or federally chartered bank in California, (hereinafter called "Escrow Agent").

For the consideration hereinafter set forth, the Owner, Contractor, and Escrow Agent agree as follows:

1) Pursuant to Section 22300 of the Public Contract Code of the State of California, Contractor has the option to deposit securities with Escrow Agent as a substitute for retention earnings required to be withheld by Owner pursuant to the Construction Contract entered into between the Owner and Contractor for _____ in the amount of $_____, and dated _____ (hereinafter referred to as the "Contract"). Alternatively, on written request of the contractor, the owner shall make payments of the retention earnings directly to the escrow agent. When Contractor deposits the securities as a substitute for Contract earnings, the Escrow Agent shall notify the Owner within ten (10) days of the deposit. The market value of the securities at the time of the substitution, as valued by the Owner, shall be at least equal to the cumulative total cash amount then required to be withheld as retention under the terms of the contract between Owner and Contractor. If the Owner determines that the securities are not adequate it will notify Contractor and Escrow Agent, and Contractor shall deposit additional security as further determined by the Owner. Securities shall be held in the name of the Owner and shall designate the Contractor as the beneficial owner.

2) Securities eligible for investment under subdivision (c) of the above-referenced Section 22300 shall include those listed in Section 16430 of the Government Code, and shall also include bank or savings and loan certificates of deposit, interest-bearing demand deposit accounts, and standby letters of credit. Deposit of any other type of security may be permitted only by mutual agreement of the Contractor and the Owner, evidenced by an amendment to this agreement executed by all of the parties hereto.

3) Upon the deposit of adequate securities, Owner shall make progress payments to the Contractor for such funds which otherwise would be withheld from progress payments pursuant to the Contract provisions.

4) When the Owner, at Contractor's written request, makes payment of retentions earned directly to the Escrow Agent, the Escrow Agent shall hold them for the benefit of the Contractor until such time as the escrow created under this contract is terminated. The Contractor may direct the investment of the payments into securities. All terms and conditions of this agreement and the rights and responsibilities of the parties shall be equally applicable and binding when the Owner pays the Escrow Agent directly.

5) The contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the Escrow Account and all expenses of the Owner. The Owner, Contractor and Escrow Agent shall determine these expenses and payment terms.

6) The interest earned on the securities, or the money market accounts held in escrow and all interest earned on that interest shall be for the sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to the Owner.

7) Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from Owner to the Escrow Agent that Owner consents to the withdrawal of the amount sought to be withdrawn by Contractor.

8) The Owner shall have the right to draw upon the securities or any amount paid directly to Escrow Agent in the event of default by the Contractor. Upon seven (7) days written notice to the Escrow Agent from the Owner of the default, the Escrow Agent shall immediately convert the securities to cash and shall distribute the cash, including any amounts paid directly to Escrow Agent, as instructed by the Owner. Escrow Agent shall not be concerned with the validity of any notice of default given by Owner pursuant to this paragraph and shall promptly comply with Owner's instructions to pay over said escrowed assets. Escrow Agent further agrees not to interplead the escrowed assets in response to conflicting demands and hereby waives any present or future right of interpleader.

9) Upon receipt of written notification from the Owner certifying that the Contract is final and complete, and that the Contractor has complied with all requirements and procedures applicable to the Contract, Escrow Agent shall release to Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all money and securities on deposit and payment of fees and charges.

10) Escrow Agent shall rely on the written notifications from the Owner and Contractor pursuant to Sections (3), (5), (6), (7) and (8) of this Agreement and the Owner and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of the securities and interest as set forth above.

11) Securities eligible for investment under this Agreement, as provided by Public Contract Code § 22300, shall be those listed in Section 16430 of the Government Code, bank or savings and loan certificates of deposit, interest bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by the Contractor and Owner.

12) The venue of any litigation concerning the rights and obligations of the parties to this agreement shall be the County of MONO and the parties hereto waive the removal provisions of Code of Civil Procedure Section 394.

13) The names of the persons who are authorized to give written notice or to receive written notice on behalf of the Owner and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

Financial Services Manager

On behalf of Owner:

Title_____

Name_____

Signature_____

Address_____

On behalf of Contractor:

Title_____

Name_____

Signature_____

Address_____

On behalf of Escrow Agent:

Title_____

Name_____

Signature_____

Address_____

At the time the Escrow Account is opened, the Owner and Contractor shall deliver to the Escrow Agent a fully executed counterpart of this Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement by their proper officers on the date first set forth above.

Owner:

Title_____

Name_____

Signature_____

Address_____

Contractor:

Title_____

Name_____

Signature_____

Address_____

Escrow Agent:

Title_____

Name_____

Signature_____

Address_____

(End Escrow Agreement)

6. Itemized Breakdown: The Contractor shall submit a financial breakdown of the work, itemized by crafts or sections as designated by the Architect or Engineer. The Contractor's payment shall be based upon the monthly percentage of completion of these items.

7. Lien Waivers: The Owner or Architect or Engineer may require the Contractor to submit, along with the progress payment request, notarized lien waivers from each Subcontractor, materials or equipment supplier. Lien waivers shall comply with Civil Code § 8132, et seq., and the aggregate sum thereof shall reflect all progress payments previously made.

D. CERTIFICATES FOR PAYMENT

1. The Architect or Engineer shall, within seven (7) days after the receipt of the Project Application for Payment, review the Project Application for Payment and either issue a Project Certificate for Payment to the Owner for such amounts as the Architect or Engineer determines are properly due, or notify the Contractor in writing of the reasons for withholding a Certificate provided in Section F of this Article 2.24.

2. The issuance of a Project Certificate for Payment will constitute a representation by the CM to the Owner that, based on the CM's observations at the site as provided herein and the data comprising the Project Application for Payment, the Work has progressed to the point indicated and that, to the best of the CM's knowledge, information and belief, the quality and timeliness of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work for conformance with the Contract Documents upon Completion of the Work, to the results of any subsequent tests required by or performed under the Contract Documents, to minor deviations from the Contract Documents correctable prior to completion, and to any specific qualifications stated in the Certificate); and that based upon all currently available information, the Contractor is entitled to payment in the amount certified. However, by issuing a Project Certificate for Payment, the CM shall not thereby be deemed to represent that the CM has made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, has reviewed the construction means, methods, techniques, sequences or procedures, or has made any examination to ascertain how or for what purpose the Contractor has used the monies previously paid on account of the Contract Sum.

E. PROGRESS PAYMENTS

1. After the CM has issued a Project Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents.

2. The Contractor shall promptly pay each Subcontractor upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's Work, the amount to which Subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to the Contract on account of such Subcontractor's Work. The Contractor shall, by an appropriate agreement with each Subcontractor, require each Subcontractor to make payments to their Sub-subcontractors in similar manner.

3. The CM may on request of any Subcontractor, at the CM's discretion, furnish to that Subcontractor, if practicable, information regarding the percentages of completion or the amounts applied for by the Contractor and the action taken thereon by the CM on account of Work done by such Subcontractor.

4. Neither the Owner nor the CM shall have any obligation to pay or to see to the payment of any monies to any Subcontractor or Material Suppliers except as may otherwise be required by law.

5. Neither certification of a progress payment, delivery of a progress payment, nor partial or entire use or occupancy of the Project by the Owner, shall constitute an acceptance of any Work not performed in accordance with the Contract Documents.

F. PAYMENTS WITHHELD

1. The CM may decline to certify payment and may withhold the Certificate in whole or in part to the extent necessary to reasonably protect the Owner, if, in the CM's opinion, the CM is unable to make representations to the Owner as provided herein above for Certificates for Payment. If the CM is unable to make representations to the Owner and certify payment in the amount of the Project Application, the CM will notify the Contractor as provided herein. If the Contractor and the CM cannot agree on a revised amount, the CM will promptly issue a Project Certificate for Payment for the amount for which the CM is able to make such representations to the Owner. The CM may also decline to certify payment or, because of subsequently discovered evidence or subsequent observations, the CM may nullify the whole or any part of any Project Certificate for Payment previously issued to such extent as may be necessary, in the CM's opinion, to protect the Owner from loss because of:

    a. Defective Work not remedied;
    b. Third party claims filed or reasonable evidence indicating probable filing of such claims, including claims by separate contractors;
    c. Failure of the Contractor to make payments properly to Subcontractors, or for labor, materials or equipment;
    d. Architect or Engineer’s determination, based upon reasonable evidence, that the Work cannot be completed for the unpaid balance of the Contract Sum;
    e. Damage to the Owner or another contractor;
    f. Architect or Engineer’s determination, based upon reasonable evidence, that the Work will not be accomplished in compliance with the Contract Time;
    g. Persistent failure to carry out the Work in accordance with the Contract Documents;
    h. Failure of the Contractor to submit Construction Schedules or Submittal and Procurement Schedules as required;
    i. Failure of the Contractor to maintain as-built drawings on a current basis;
    j. Failure of the Contractor to submit notarized lien waivers from each Subcontractor, materials or equipment supplier;
    k. Failure of the Contractor to submit certified payroll reports;
    l. Stop notice served upon the Owner.

2. A retention in the amount of one-thousand dollars ($1,000) will be withheld from the Contractor's monthly progress payment for each and every required document not submitted in a timely manner by the Contractor or its subcontractors up to a maximum of ten-thousand dollars ($10,000). For purposes of this Paragraph, the term "required document" includes, but is not limited to, certified payrolls, labor compliance documents, Disadvantaged Business Enterprise documents, and any other information or documents required to be submitted by the Contractor or any of its subcontractors under the terms of this Agreement or pursuant to applicable federal, state or local laws or regulations. The retention provided for in this Paragraph shall be in addition to any other deduction or retention allowed under this Agreement, and shall be in addition to any other remedy or consequence provided by law for untimely submission of any required document. Such retention shall remain in effect only until such time as the required documents have been submitted by the Contractor or its subcontractor(s) and have been determined by the Owner to be both complete and acceptable as to form.

3. When the grounds as noted above are removed, payment shall be made for amounts withheld on the basis thereof.

G. COMPLETION AND FINAL PAYMENT

1. Following the Contractor's completion of the Work, the Contractor shall forward to the CM a written notice that the Work is ready for final inspection and acceptance, and shall also forward to the Construction Manager a final Application for Payment. Upon receipt, the Construction Manager will promptly make such inspection. When the Construction Manager finds the Work acceptable under the Contract documents and the Contract fully performed, the CM will issue a Project Certificate for Payment which will certify the final payment due the Contractor. This certification will constitute a representation that, to the best of the IOR's knowledge, information and belief, and on the basis of observations and inspections, the Work has been completed in accordance with the Terms and Conditions of the Contract Documents and that the entire balance found to be due the Contractor, and noted in said Certificate, is due and payable. The CM's certification of said Project Certificate for Payment will constitute a further representation that the conditions precedent to the Contractor's being entitled to final payment as set forth herein below have been fulfilled.

2. Neither the final payment nor the remaining retainage shall become due until the Contractor submits to the CM (1) an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might in any way be responsible, have been paid or otherwise satisfied, (2) consent of surety, if any, to final payment, and (3) other data establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of liens arising out of the Contract, to the extent and in such form as may be designated by the Owner. If any Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against any such lien. The bond cannot be from the original surety insurer for the project or any affiliate of the original surety. If any such lien remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all monies that the latter may be compelled to pay in discharging such lien.

3. All provisions of this Agreement, including without limitation those establishing obligations and procedures, shall remain in full force and effect notwithstanding the making or acceptance of final payment, and the making of final payment shall not constitute a waiver of any claims by the Owner.

4. Upon completion and acceptance of all work whatsoever required, and upon the release of all claims against the Owner as specified, the Owner shall file a written Notice of Completion with the County Recorder as to the entire amount of work performed.

5. Final payment will be released within sixty (60) days after the date of acceptance of the Work as reflected in the Notice of Completion filed with the County Recorder's Office; provided, that Owner may withhold from the final payment, in the event of a dispute between Owner and Contractor, retentions in and amount not exceeding 150 percent of the disputed amount.

6. All manufacturer's warranties required by the Contract Documents shall commence on the date of the Notice of Completion for the Work. It shall be the Contractor's responsibility, through appropriate contractual arrangements with all subcontractors, material men and suppliers, to ensure compliance with this requirement.

7. The acceptance by the Contractor of the final payment, after the date of Notice of Completion of the Project, shall be and shall operate as a release to the Owner of all claims and of all liability to the Contractor, under the Contract Documents or otherwise, for all things done or furnished in connection with this Work, excepting only the Contractor's claims for interest upon final payment, if such final payment be improperly delayed. No payments, however, final or otherwise, shall operate to release the Contractor or his/her sureties from any obligations under the Contract Documents, including but not limited to the Performance and Payment Bonds.

2.25 CHANGES TO THE CONTRACT

A. The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract consisting of additions, deletion or other revisions, the Contract Sum and Contract Time being adjusted accordingly. All such changes in the Work shall be authorized by Change Order, and shall be performed under the applicable conditions of the Contract Documents.

B. CHANGE ORDER: A Change Order is a written order to the Contractor dually signed to show both the approval of the Architect or Engineer and Authorization of the Owner, issued after execution of the Contract, authorizing a change in the Work or an adjustment in the Contract Sum or the Contract Time. Only an executed Change Order will effectuate change in either the Contract Sum and/or the Contract Time. A Change Order signed by the Contractor indicates the Contractor's agreement therewith, including any adjustment in the Contract Sum or the Contract Time, and the full and final settlement of all costs (direct, indirect and overhead) related to the Work authorized by the Change Order.

C. All claims for additional compensation to the Contractor shall be presented in writing before the expense is incurred and will be adjusted as provided herein. No work shall be allowed to lag pending such adjustment, but shall be promptly executed as directed, even if a disputed claim

arises. No claim will be considered after the work in question has been done unless a written contract change order has been issued or a timely written notice of claim has been made by Contractor. All claims for additional compensation shall be submitted to the Owner separated by each of the base bid categories as noted in Contract Section 00 42 13.

D. Costs mean an itemized breakdown of all labor (by crafts), materials, sales taxes, equipment rentals, etc., for each portion of the Work which comprises the change order including any Subcontractor's itemized breakdown, plus not more than twenty (20) percent to cover all profits and administration. The cost or credit to the Owner resulting from a change in the Work shall be determined in one or more of the following ways:

1. by mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation.
2. by unit prices stated in the Contract Documents or subsequently agreed upon;
3. by cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
4. by the method provided under Article 2.26.

E. The amount of credit to be allowed by the Contractor to the Owner, as confirmed by the CM, for any deletion or change that result in a decrease in the Contract Sum will be the amount of the actual cost. When both additions and credits covering related Work or substitutions are involved in any one change, the allowance for overhead and profit shall be figured on the basis of the net increase, if any, with respect to that change.

F. Variation in Estimated Quantities: If unit prices are stated in the Contract Documents or subsequently agreed upon, and if the quantities originally contemplated are so changed in a proposed Change Order, and application or the agreed unit prices to the quantities of Work proposed will cause substantial inequity to the Owner or the Contractor, the applicable unit prices shall be equitably adjusted.

2.26 CHANGES TO THE CONTRACT (EXTRA WORK AT FORCE ACCOUNT)

A. If none of the methods set forth in Article 2.25 - D.1, D.2, or D.3 above is agreed upon, the Contractor, provided that a written order signed by the Owner is received, shall promptly proceed with the Work involved. The cost of such Work shall then be determined by the CM, on the basis of reasonable expenditures or savings of those performing the Work attributable to the change, including, in the case of an increase in the Contract Sum, not more than twenty percent (20%) for all overhead and profit. In such case, and also under Article 2.25 - D.3 above, the Contractor shall keep and present, in such form as the Owner or the CM may prescribe, an itemized accounting of actual cost together with appropriate supporting data for inclusion in a Change Order. Unless otherwise provided in the Contract Documents, cost shall be limited to the following:

1. Labor Cost is the cost of labor for the workers (including working foremen) used in the actual and direct performance of the extra work, whether employed by the Contractor, or Subcontractors and Specialized Forces of any tier.

Labor Cost shall include:

a. Actual Wages paid to the workers, plus employer payments to or on behalf of the workers for health and welfare, pension, vacation, and training. If required by the CM, certified payrolls shall be submitted with extra work reports as verification of wages paid to the workers.

b. A Labor Surcharge of 20 percent will be added to the Actual Wages as defined above. The Labor Surcharge shall constitute full compensation for all payments imposed by State and Federal laws, including Workers Compensation Insurance, Social Security, and Unemployment Insurance.

c. Subsistence and Travel Allowance if actually paid to the workers. Labor Surcharge will not be added to Subsistence and Travel Allowance.

2. Equipment Cost is the payment made for the equipment actually used in the performance of the extra work.

   a. Equipment valued at three hundred dollars $300 or less shall be considered as small tools, and no payment will be made therefor.

   b. Equipment costs will be paid

   c. In the event that any of the equipment to be used is not listed in the above publication, the rental rate shall be agreed upon in writing by the Contractor and the CM before the extra work is begun.

3. Materials Cost is the payment made for materials incorporated into the work.

   a. Materials cost shall include sales tax, freight and delivery charges, less any available discounts whether or not said discounts are taken.

   b. Materials cost shall be based upon supplier's or manufacturer's invoice. If invoices or other satisfactory evidence of cost are not furnished within sixty (60) days of delivery or within fifteen (15) days after acceptance of the contract, whichever occurs first, then the CM shall determine the materials cost, in his/her sole discretion, on the basis of available information and on his/her considered experience.

4. Specialized Services are those services or items of extra work that, by agreement of the Contractor and the CM, cannot be performed by forces of the Contractor or his/her Subcontractors, and may be performed by a specialist.

   a. Specialized services may be paid for by invoice if the established practice of the specialized force industry does not provide complete itemization of labor, equipment and materials costs.

5. Markup for Profit, Home Office and Field Office Overhead, Bond Premium, insurance, taxes and supervision will be added to the total of Labor Cost, Equipment Cost, Materials Cost and Specialized Services.

    a. Markup will be added only once on any extra work at force account, regardless of the number of contractors and subcontractors involved.

    b. It is recognized that individual contractors and subcontractors have different overhead costs, profit requirements and bond premium rates. The amount to be added to extra work for markup shall include compensation for profit, overhead and bond premium without distinguishing among these items.

    c. The markup to be added for extra work at force account on this project shall be fifteen percent (15%) plus 1-1/2% for Performance and Payment bonds for Contractor only.

6. Records shall be maintained by the Contractor and Subcontractors in such a manner as to provide a clear distinction between the costs of extra work paid for on a force account basis and the costs of other operations. From these records, the Contractor shall furnish the IOR completed extra work reports for each day's extra work to be paid for on a force account basis. Extra work reports shall itemize the materials used, equipment rental charges, and specialized services costs, and shall provide names or identifications and classifications of workmen, the hourly rate of pay, and hours worked. Extra work reports shall be compiled and submitted to the IOR daily for verification and signature. Extra work reports shall be signed by the Contractor or his/her authorized representative.

7. If the Contractor disputes the Architect or Engineer's cost determination, the Contractor may initiate a claim in compliance with the claims and disputes resolution provisions of these General Conditions.

2.27 SITE CONDITIONS

A. Where investigations have been conducted by the Owner of existing conditions on the Site, including subsurface conditions, such investigations are made for the purpose of design only and for the information of bidders. The results of such investigations represent only the statement by the Owner as to the circumstance and character of materials actually encountered by the Owner during the investigations. The Owner makes no guarantee or warranty, express or implied, that the conditions indicated are representative of conditions existing throughout the Site of the Project or any part of it, or that unanticipated conditions might not occur.

B. All excavation work shall be performed on an "unclassified basis"; that is, such work shall include the removal of all material encountered including earth or rock formations, regardless of the type or hardness thereof, or groundwater conditions in the excavation, the cost of such excavations being included in the Contract Price at the time of bidding. Unclassified excavation Work includes drilling or blasting operations.

C. If site conditions are discovered that materially differ from previous information that the Contractor has received, and that could not have been discovered by the Contractor through

prudent and reasonable investigation prior to pricing his/her bid for the work, the Contractor shall be compensated for additional costs incurred in working with the unknown site conditions, but only to the extent that such previously unknown and undiscoverable site conditions cause the Contractor to incur costs in addition to the bid price for that portion of the work. The Contractor must be able to demonstrate clearly the original bid price for that portion of the work (plus any approved change orders applicable to that portion of the work) and the additional costs incurred as a direct result of the unknown site conditions. Only additional costs over and above the amount of the original bid price for that portion of the work will be compensated upon a recommendation of approval by the Architect or Engineer.

2.28 REQUEST FOR EQUITABLE ADJUSTMENT

A. If the Contractor considers a Request for Equitable Adjustment is justified for any increase in the Contract Time, the Contractor shall promptly, upon first observance of the condition giving rise to the request, provide the CM and Owner written notice of such condition and circumstance. This notice shall be given by the Contractor before proceeding to execute the Work, except in emergency endangering life or property, in which case the Contractor shall proceed in accordance with the Emergency provisions of these General Conditions. No such request shall be valid unless so made. A Change Order shall be required to authorize any change in the Contract Time resulting from such request for equitable adjustment.

B. If the Contractor requests that additional cost or time is involved because of, but not limited to, (1) any written interpretation pursuant to Article 2.07.G, (2) any order by the Owner to stop the Work pursuant to Article 2.08 where the Contractor was not at fault, or any such order by the CM as the Owner's agent, (3) any written order for a minor change in the Work issued pursuant to Article 2.29, the Contractor shall make such request for equitable adjustment as provided in Article 2.28.A.

2.29 MINOR CHANGES IN THE WORK

The CM will have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be enacted by written order issued through the CM, and shall be binding on the Owner and the Contractor. The Contractor shall carry out such written orders promptly.

2.30 SUCCESSORS AND ASSIGNS

The Owner and the Contractor, respectively, bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party with respect to all covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract or sublet it as a whole without the written consent of the other.

2.31 ASSIGNMENT OF MONEYS

The Contractor shall not assign moneys due or to become due him/her under the contract without the written consent of the Auditor-Controller of Mono County. Any assignment of moneys shall be subject to all proper set-offs in favor of the County of Mono and to all deductions provided for in the contract and particularly all money withheld, whether assigned or not, shall be subject to being used by the County of Mono for the completion of the work in the event that the Contractor should be in default therein.

2.32 GUARANTEE OF WORK

A. The Contractor warrants to the Owner that all materials and equipment and the work as a whole furnished under this Contract will be new unless otherwise specified, and that all Work will be of good quality, free from faults and defects and in conformance with the Contract Documents, for one (1) year from the date of Notice of Completion of the Contract, unless a longer period is otherwise specified. All manufacturer's warranties required by the Contract Documents shall commence on the date of the filing of the Notice of Completion for the Work (which date necessarily will follow the performance under separate contracts. It shall be the Contractor's responsibility, through appropriate contractual arrangements with all subcontractors, material men and suppliers, to ensure compliance with this requirement. All Work not conforming to these requirements, including substitutions not properly reviewed and authorized, may be considered defective. If required by the IOR, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

B. If repairs or changes are required in connection with guaranteed work within any guaranteed period, which, in the opinion of the CM is rendered necessary as the result of the use of materials, equipment or workmanship which are inferior, defective, or not in accordance with the Contract Documents, the Contractor shall, promptly upon receipt of notice from the Owner, and without expense to the Owner (1) place in satisfactory condition in every particular all of such guaranteed work, correct all defects therein, and (2) make good all damage to the building or site, or equipment or contents thereof, which, in the opinion of the IOR, is the result of the use of materials, equipment or workmanship which are inferior, defective, or not in accordance with the Contract Documents; and (3) make good any work or materials, or the equipment and contents of said building or site disturbed in fulfilling any such guarantee.

C. If the Contractor disturbs any work guaranteed under another contract in fulfilling the requirements of the contract or of any guarantee, embraced in or required thereby, he/she shall restore such disturbed work to a condition satisfactory to the CM and guarantee such restored work to the same extent as it was guaranteed under such other contract.

D. The Owner may have the defects corrected if the Contractor, after notice, fails to proceed promptly to comply with the terms of the guarantee and the Contractor and his/her surety shall be liable for all costs and expenses incurred in connection therewith.

E. All special guarantees applicable to definite parts of the work that may be stipulated in the Contract Documents shall be subject to the terms of this paragraph during the first (1st) year of the life of such special guarantee.

2.33 RESPONSIBILITY FOR DAMAGE

A. Neither the Owner, the Architect or Engineer, nor any officer or employee of the County, or officer or employee thereof, within the limits of which the work is being performed, shall be answerable or accountable in any manner, for any loss or damage that may happen to the work or any part thereof; or for any of the materials or other things used or employed in performing the work; or for injury to any person or persons, either workmen or the public, for damage to property from any cause which might have been prevented by the Contractor, or his/her workmen, or anyone employed by him/her, against all of which injuries or damages to persons and property the Contractor having control over such work must properly guard.

B. The Contractor shall be responsible for any liability imposed by law for any damage to any person or property resulting from defects or obstructions or from any cause whatsoever during the progress of the work or at any time before the issuance of the Notice of Completion.

C. The Contractor shall indemnify and hold harmless the Owner, the CM, the Architect, and all of their respective officers and employees, from all claims, lawsuits or actions of every kind and nature whatsoever, brought for, or on account of any injuries or damages received or sustained by any person or persons, resulting from any act or admission by the Contractor or his/her servants or agents, in the construction of the work or by or in consequence of any negligence in guarding the same, in improper materials used in its construction, or by or on account of any act or omission of the Contractor or his/her agents in the performance of Contractor's obligations under the Contract Documents. In addition to any remedy authorized by law, so much of the money due the Contractor under and by virtue of the contract as shall be considered necessary by the Owner may be retained by the Owner until disposition has been made of such claims, lawsuits or actions for damages as aforesaid.

2.34 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual or member of the firm or entity or to an officer of the corporation for whom it was intended, or if delivered at or sent by registered or certified mail.

2.35 RESOLUTION OF CONTRACT CLAIMS AND DISPUTES

A. A Claim is a demand or assertion by one (1) of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time, or a request for equitable adjustment or Change Order which can not be resolved per provisions of Article 2.25 - CHANGES TO THE CONTRACT. Any Claim shall be reduced to writing and filed with the IOR, within ten (10) calendar days after the Contractor has notice of the condition giving rise to the Claim, and final action per Article 2.25 - CHANGES TO THE CONTRACT procedures has taken place or has been declared as such in writing, by either party. Such ten (10)-day notice of an asserted claim is in addition to the requirement for prompt notice required per Article 2.25 - CHANGES TO THE CONTRACT.

B. The Contractor shall not claim or recover any overhead cost administrative or otherwise, particularly 'Home Office' expenses, 'Extended site overhead', or any other overhead cost on the basis of any 'Home Office' damages formula, 'Eichleay' formula, 'Total Cost' recovery formula or any other such formula.

C. **REQUIREMENTS FOR FILING A CLAIM**. Claims must be filed within the time specified above, but in no event later than the date of final payment. Claims shall be submitted to the IOR. The claim shall be in writing and shall be a sum certain if known. If unknown, Contractor shall specify the basis for establishing the sum certain. Claim shall include a statement of the reasons for the asserted entitlement, and include the documents necessary to substantiate the claim. Such documents may include but are not limited to payroll records, purchase orders, quotations, invoices, estimates, subcontracts, daily logs, supplier contracts, subcontract billings, bid takeoffs, equipment rental invoices, ledgers, journals, daily reports, job diaries, and any documentation related to the requirements of Article 2.25 - CHANGES TO THE CONTRACT. In the case of a continuing delay, only one (1) claim is necessary. If adverse weather conditions are the basis for a claim for additional time, such claim shall be documented by data substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the critical activities on the construction schedule. The Contractor shall certify, at the time of submission of a claim, as follows:

"I, _____, being the _____ (MUST BE AN OFFICER) of _____ (GENERAL CONTRACTOR), declare under penalty of perjury under the laws of the State of California, and do personally certify and attest that: I have thoroughly reviewed the attached claim for additional compensation and/or extension of time, and know its contents, and said claim is made in good faith; The supporting data is truthful and accurate; That the amount requested accurately reflects the contract adjustment for which the Contractor believes the Owner is liable; and, further, that I am familiar with California Penal Code Section 72 and California Government Code Section 12560, et seq, pertaining to false claims, and further know and understand that submission or certification of a false claim may lead to fines, imprisonment and/or other severe legal consequences.

By:_____ _____
(Contractor's signature) (Date)

D. Nothing in this Article is intended to extend the time limit or supersede notice requirements otherwise provided by this contract or by applicable law for the filing of claims. Any formal claim shall be processed in accordance with the provisions of Public Contract Code Section 9204 and Section 20104 et seq., each of which establishes a process for resolution of claims, the provisions of which are consistent with and effectively summarized by the following:

1. The Owner (or his/her designee) shall review the facts pertinent to the claim, obtain additional information deemed necessary for a decision (if any), review recommendations of the IOR, coordinate with the contract administrator (if any) and secure assistance from legal and other advisors, and render a written decision on the claim within forty-five (45) days of receipt of the claim. If additional information or documentation is thereafter required, it shall

be requested and provided pursuant to this subdivision, upon mutual agreement of the Owner (or his/her designee) and claimant. The Owner's (or his/her designee's) written response to the claim, as supplemented by any additional information and/or documentation provided by claimant, shall be submitted to the claimant within fifteen (15) days after receipt of the further information and/or documentation or within a period of time no greater than that taken by the claimant in producing the additional information, whichever is greater.

2. If the claimant disputes the written response of Owner (or his/her designee), or Owner fails to respond within the time prescribed, the claimant may so notify the Owner (or his/her designee), in writing, either within fifteen (15) days of receipt of the Owner (or his/her designee's) response or within fifteen (15) days of the Owner (or his/her designee's) failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the Owner (or his/her designee) shall schedule a meet and confer conference within thirty (30) days for settlement of the dispute.

3. Within ten (10) business days following conclusion of the meet and confer conference, any unpaid portion of the claim remaining in dispute shall be submitted to nonbinding mediation, as that term is defined by Public Contract Code Section 9204(d((2)(C). .

4. If following the conclusion of the meet and confer conference and the mediation process, the claim or any portion thereof remains in dispute, the claimant may file a claim pursuant to Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the claimant submits his/her written claim pursuant to subdivision (a) until the time the claim is denied, including any period of time utilized by the meet and confer conference and mediation process as described in the immediately preceding Paragraphs 2 and 3 of this Section D

5. In the event of any perceived conflict between the summary of the procedure set forth in this Article and the actual provisions of the Public Contract Code Section 9204 and Section 20104, et seq. (a true and correct copy of which is attached as Appendix A hereto and incorporated by this reference as though fully set forth herein), the statutory provisions shall control; and in the event of any perceived conflict between the provisions of Section 9204 and Section 20104, et seq., the provisions of Section 9204 shall control.

E. **Procedures for Civil Actions to Resolve Disputed Claims**: Non-binding Mediation: Within sixty (60) days, but no earlier than thirty (30) days, following the filing of a responsive pleading, the court shall submit the matter to non-binding mediation unless waived by mutual stipulation by both parties. The mediation process shall provide for the selection within fifteen (15) days by both parties of a disinterested third person as mediation, shall be commenced within thirty (30) days of the submittal, and shall be concluded within fifteen (15) days from the commencement of the mediation unless a time requirement is extended upon a good cause shown to the court. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.

Judicial Arbitration: If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1141.11 of the code. The Civil Discovery Act of 1986 (Article 3 (commencing with Section 2016) of Chapter 3 of Title 3 of Part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subsection consistent with the rules pertaining to judicial arbitration. Arbitrators shall be experienced in construction law.

Appeals: As provided by statute (specifically Public Contract Code section 20104.4(b)(3) and Code of Civil Procedure section 1141.21), any party appealing an arbitration award who does not obtain a more favorable judgment shall, in addition to payment of costs and fees, also pay the attorneys' fees on appeal of the other party.

F. **CLAIMS AND DISPUTES EXEMPT FROM FILING REQUIREMENTS.** The requirements and procedures imposed by this Article do not apply to:

1. Any claims by the Owner;

2. Any claim for or respecting personal injury or death or reimbursement or other compensation arising out of or resulting from liability for personal injury or death;

3. Any claim or dispute relating to stop payment requests or stop notices;

4. Any claim or dispute related to the approval, refusal to approve, or substitution of Subcontractors, regardless of tier, and suppliers; and

G. **PAYMENT OF UNDISPUTED PORTION OF CLAIM**. Owner shall pay claimant such portion of a claim that is undisputed except as otherwise provided in the contract.

H. **CONTINUE WORK DURING DISPUTE**. In the event of any disputed claim or other dispute between the Owner and the Contractor, the Contractor will not stop work but will prosecute the work diligently to completion in his/her manner directed by the Owner, and the dispute shall be resolved by a court of law after completion of the Work. However, Contractor must submit all disputes in accordance with the provisions of Article 2.35.

2.36 PERFORMANCE BOND, LABOR AND MATERIAL PAYMENT BOND AND WARRANTY BOND

A. The Contractor shall furnish Performance Bond in the amount of one hundred percent (100%) of the Contract amount, Payment Bond in the amount of one hundred percent (100%) of the Contract amount and One Year Warranty Bond in the Amount of ten percent (10%) of the final Contract Amount.

B. All bonds required, whether Bid bonds, Performance, Payment, Warranty or other bonds, shall be issued by an admitted surety insurer. The same admitted surety insurer must issue the Bid Bond, Performance Bond, Payment Bond, and Warranty Bond. The payment, performance and warranty bonds required by these specifications will neither be accepted nor approved by the Owner unless the bonds are underwritten by an admitted surety and the requirements of California Code of Civil Procedure section 995.630 are met. The bonds must include a physical mailing address, phone number, FAX number, and contract person for the admitted surety insurer. The Owner further reserves the right to satisfy itself as to the acceptability of the surety and the form of bond**.** Upon request of the Owner, the bidder must submit the following documents:

1. The original, or a certified copy, of the unrevoked appointment, power of attorney, bylaws, or other instrument authorizing the person who executed the bond to do so.

2. A certified copy of the certificate of authority of the insurer issued by the California Insurance Commissioner.

3. A certificate from the county clerk that the certificate of authority has not been surrendered, revoked, canceled, annulled, or suspended, or in the event that it has, that renewed authority has been granted.

4. A financial statement of the assets and liabilities of the insurer to the end of the quarter calendar year prior to thirty (30) days next preceding the date of the execution of the bond, in the form of an officers' certificate as defined in Corporations Code § 173.

2.37 RIGHTS AND REMEDIES

A. The duties and obligations imposed by the Contract Documents and the rights and remedies available hereunder shall be in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.

B. No action or failure to act by the Owner, or by the CM or Architect, regarding any deficiency, breach or default in performance by the Contractor under the Contract Documents, shall be deemed or construed to constitute acquiescence of the Owner in connection therewith or with regard to any subsequent deficiency, breach or default in performance by the Contractor; nor shall any such prior act of failure to act by or on behalf of Owner be deemed or construed as a waiver of any rights in favor of Owner regarding any such deficiency, breach or default in performance by the Contractor, regardless of the similarity to the prior incident or circumstance when no action was taken regarding any alleged deficiency, breach or default in performance by the Contractor.

2.38 TIME, DELAYS AND LIQUIDATED DAMAGES

A. DEFINITIONS

1. Unless otherwise provided, the Contract Time is the period of time allotted in the Contract Documents for completion of the Work, including authorized adjustments thereto.

2. The Date of Commencement of the Work is the date established in the Notice to Proceed.

3. The Date of Completion of the Work is the date of which the work is certified as complete by the Architect or Engineer as specified in the Notice of Completion.

4. The term “day” as used in the Contract Documents shall mean calendar day unless specifically designated otherwise.

B. PROGRESS AND COMPLETION

1. Time is of the essence regarding all time limits stated in the Contract Documents. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

2. The Contractor shall begin the Work on the Date of Commencement. The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required herein to be furnished by the Contractor. The Date of Commencement of the Work shall not be changed by the effective date of such insurance.

3. The Contractor shall carry the Work forward expeditiously with adequate forces and shall achieve Completion of the Work within the Contract Time.

C. DELAYS AND EXTENSIONS OF TIME

1. Delays in prosecution of parts or classes of the Work that are not demonstrated to prevent or delay completion of the entire Project or specific milestones within the Contract Time are not "unavoidable delays" for purposes of this section.

2. In all cases, the time authorized for extension of the Contract Time shall be no greater than the number of days directly attributable to the event or circumstances which causes unavoidable delay in the completion of the Project. Contractor shall be entitled, in the case of unavoidable delays, to an extension in the Contract time, but not to any increase to the Contract price. "Unavoidable delay" for this purpose shall be defined as follows:

    a. **Unavailable Materials**. That materials or articles called for in the Contract Documents are not obtainable within the time required for timely completion; provided that such materials or articles were listed by the Contractor in the schedule required by Article 2.17 - CONTRACTOR’S CONSTRUCTION SCHEDULE; that the Contractor demonstrates that the unavailability of the materials is in fact the cause for the delay, and could not have been avoided by an appropriate adjustment in the Construction Schedule; and that the unavailability of such materials is due to circumstances beyond the Contractor's control. If good cause for delay is demonstrated pursuant to this subsection, the Owner, at its sole discretion, may grant a time extension.

b. **Force Majeure**. That delays in construction have resulted from circumstances beyond the control of the Contractor and which the Contractor could not have provided against by the exercise of reasonable care, prudence, foresight, and diligence. Unavoidable delays within the meaning of this subparagraph shall be those caused by acts of God, war, insurrection, civil disorder, fire, floods, epidemic, or strikes.

c. **Unseasonable Weather**. An extension of time may be granted due to weather which is unsuitable for the Work currently in progress, upon the determination of the Owner that the weather conditions in fact caused the delay in completion of the Project and that such weather conditions were not, and could not in the exercise of reasonable diligence, have been foreseen by the Contractor. Seasonable weather that, in the exercise of reasonable foresight and diligence, should be expected in the area at the time of year in question is not cause for an extension of time.

d. **Time Extensions Due to Change Orders or Work Authorizations**. A time extension may be granted due to additional work that results in a delay in the Project caused by the approval by the Owner of a Change Order or Work Authorization. The Contractor shall be entitled to a time extension Change Order only when the extra Work is demonstrated by the Contractor to have caused a delay in the Project.

e. **Owner Caused Delays**. In the event that the Project is delayed by acts of the Owner not authorized by the Contract Documents which the Contractor demonstrates will or have caused an unavoidable delay, the Contractor shall be entitled to a Contract Time Change Order to offset the extra time incurred by the Contractor. The Contractor will not be entitled to adjustments in the contract price. Extra time shall be limited to that which is directly identified as critical by the delay.

3. The Contractor specifically agrees that a time extension as provided herein is its sole remedy for Owner-caused delays, and agrees to make no claim or demand for additional damages, nor claim an acceleration of the time for performance.

4. The Contractor shall not be entitled to any Contract Time extension nor Contract Price adjustment for alleged Owner delays if the Owner has acted within the time limits specified by the Contract Documents.

D. NOTICE OF DELAYS

1. Contractor shall notify the CM promptly whenever the Contractor foresees any event or circumstance that may delay the prosecution of the Work and in Contractor's opinion may provide grounds for an extension, and shall in any event notify the CM immediately upon the occurrence of any such delay. The Contractor shall take immediate steps to prevent, if possible, the occurrence or continuance of the delay. If this cannot be done, the CM shall determine how long the delay shall continue and to what extent the prosecution and completion of the Work are being delayed thereby. Such notification shall specify with detail the cause asserted by the Contractor to constitute grounds for an extension. Failure of the Contractor to submit such a notice within ten (10) days after the initial occurrence of the

event-giving rise to the delay shall constitute a waiver by the Contractor of any request for a time extension, and no extension shall be granted as a consequence of such delay.

2. If the Contractor believes that the delay in prosecution in the Work will result in an unavoidable delay in completion of the entire Project, the Contractor shall submit evidence to support that belief, together with its request for a time extension. Such evidence shall include a demonstration that the delayed portion of the Work will affect the Critical Path Scheduling of the entire Project. The Contractor shall also submit a proposed revised Construction Schedule, which accounts for the delay in completion of the entire Project caused by the delay in prosecution of part of the Project, and includes a revised Critical Path demonstrating how the Project will be completed within the proposed revised Contract Time.

E. INVESTIGATION; PROCEDURE.

1. Upon receipt of a request for Contract Time extension, the CM shall conduct an investigation of the facts asserted by the Contractor to constitute grounds for an extension. The results of this investigation shall be reported by the CM to the Contractor and shall indicate whether he/she will recommend for or against such extension to the Owner. The performance of this investigation by the CM shall not be construed as direction or recommendation to the Contractor regarding scheduling of the work. Scheduling this work is the sole responsibility of the Contractor.

2. The CM may, in his/her sole discretion, defer this recommendation to allow the accumulation of time extensions due to Work Authorizations into a periodic or final Change Order request.

3. Upon receiving the Architect or Engineer's recommendation to the Owner regarding the Contractor's request for a time extension, the Contractor may either withdraw its application for extension or request that it be scheduled for action by the Owner. If the Owner disallows the request, there shall be no allowance made for the time during which the request was pending, and the Contractor shall remain obligated to complete the Work in the time specified.

4. If the Owner approves the time extension Change Order, the new Construction Schedule submitted by the Contractor and approved by the Owner shall be deemed to amend the original Construction Schedule approved by the Owner; thereafter, the amended Construction Schedule shall have the same force and effect as the originally approved Progress Schedule.

5. The revised Construction Schedule must be submitted within seven (7) calendar days of the date in which the Owner approves the change.

6. The Contractor agrees that the Owner’s determination as to the existence of grounds for an extension and, the duration of any such extension, shall be final and binding upon both Owner and Contractor.

F. DISCRETIONARY TIME EXTENSION FOR BEST INTEREST OF OWNER

1. The Owner reserves the right to extend the Contract Time for completion of the Work if the Board of Supervisors determines that such extension is in the best interest of the Owner.

2. In the event that such discretionary extension is made at the request of the Contractor, the Owner shall have the right to charge to the Contractor all or any part, as the Board may deem proper, of the actual cost to the Owner for engineering, inspection, supervision, contract administration, incidental and other overhead expenses that accrue during period of such extension, and to deduct all or any portion of such amounts from the final payment for the Work.

3. In the event such extension is ordered over the objection of the Contractor, the Contractor shall be entitled to a Change Order adjusting the price paid to reflect the actual costs incurred by the Contractor as a direct and proximate result of the delay, upon his/her written application therefor, accompanied by such verification of costs as the CM requires. Only additional direct costs incurred at the site will be reimbursable by Change Order.

G. LIQUIDATED DAMAGES

1. If the Work is not completed by Contractor in the time specified in the Agreement for Construction or within any period of extension authorized pursuant to this Article, the Contractor acknowledges and admits that the Owner will suffer damage, and that it is impracticable and infeasible to fix the amount of actual damages. Therefore, it is agreed by and between the Contractor and the Owner that the Contractor shall pay to the Owner as fixed and liquidated damages, and not as a penalty, the sum of $2,500 per day as specified in Section 00 52 13, Agreement, Article III for each calendar day of delay until the Work is completed and accepted, and that both the Contractor and the Contractor's surety shall be liable for the total amount thereof, and that the Owner may deduct said sums from any monies due or that may become due to the Contractor.

2. This liquidated damages provision shall apply to all delays of any nature whatsoever, save and except only unavoidable delays approved by the Owner pursuant to provisions hereinabove, or discretionary time extensions approved by the Board of Supervisors pursuant to provisions hereinabove.

H. EXTENSION OF TIME NOT A WAIVER.

1. Any extension of the Contract Time granted pursuant to this Article shall not constitute a waiver by the Owner, nor a release of the Contractor, from his/her obligations to perform this Contract within the allotted Contract Time.

2. Granting of a time extension due to one (1) circumstance on one (1) request therefore shall not constitute a granting by the Owner of an extension of time for any other circumstance or the same circumstance occurring at some other time, and shall not be interpreted as a precedent for any other request for extension.

2.39 PROTECTION OF PERSONS AND PROPERTY

A. SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work.

B. SAFETY OF PERSONS AND PROPERTY

The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

1. All employees on the Work and all other persons who may be affected thereby;

2. All the work and all materials and equipment to be incorporated therein, whether in storage or off the site, and that is under the care, custody or control of the Contractor or any of the Contractor's Subcontractors or Sub-subcontractors;

3. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction; and

4. The work of the Owner or other separate contractors.

C. The Contractor shall give all notices and comply with all applicable laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the safety of persons or property or their protection from damage, injury or loss.

D. The Contractor shall erect and maintain, as required by existing conditions and the progress of the Work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent facilities.

E. When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.

F. The Contractor shall promptly remedy all damage or loss to any property referred to above caused in whole or in part by the Contractor, any Subcontractor, any Sub-subcontractor, anyone directly or indirectly employed by any of them, or any one for whose acts any of them may be liable, and for which the Contractor is responsible under the above noted clauses, except damage or loss attributable solely to the acts or omissions of the Owner, the CM, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable in any degree to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under the Indemnification provisions provided herein.

G. The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's

superintendent unless otherwise designated by the Contractor in writing to the Owner and the CM.

H. The Contractor shall not load or permit any part of the Work to be loaded so as to endanger its safety.

I. EMERGENCIES
In any emergency affecting the safety of persons or property the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided in the provisions herein for Changes in the Work.

2.40 INSURANCE

A. CONTRACTOR'S INSURANCE

1. Bidders' attention is directed to the insurance requirements below. It is highly recommended that Bidders confer with their respective insurance carriers or brokers to determine in advance of bid submission the availability of the insurance certificates and endorsements required below. A bidder who is awarded a contract and thereafter fails to comply strictly with the insurance requirements, will be deemed to be in default of its obligations.

2. Contractor shall procure, and maintain for the duration of the Contract, insurance against claims for injuries to persons or damage to property which may arise from or in connection with the performance of the work hereunder by the Contractor, his/her agents, representatives, employees or Subcontractors. The cost of such insurance shall be included in the Contractor's bid.

3. No later than ten (10) calendar days following the Award of the Contract, and prior to execution of the Agreement for Construction by the Owner, the Contractor shall submit certificates of insurance, signed by an authorized agent of the insurer, attesting to insurance coverage of the Contractor as required by this Article.

B. MINIMUM SCOPE OF INSURANCE.

Coverage shall be at least as broad as:

1. Insurance Services Office Commercial General Liability coverage ("occurrence" form CG0001).

2. Insurance Services Office Business Auto Coverage form number CA 0001 0187 covering Automobile Liability, code 1 "any auto".

3. Workers' Compensation insurance as required by the Labor Code of the State of California and Employers Liability insurance.

C. MINIMUM LIMITS OF INSURANCE.

Contractor shall maintain limits no less than:

1. General Liability: One million dollars ($1,000,000.00) combined single limit per occurrence for bodily injury, personal injury and property damage. If Commercial General Liability Insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be three times the required occurrence limit.

2. Automobile Liability: One million dollars ($1,000,000.00) combined single limit per accident for bodily injury and property damage.

3. Workers' Compensation and Employers Liability: Workers' compensation limits as required by the Labor Code of the State of California and Employers Liability limits of one million dollars ($1,000,000.00) per accident.

D. DEDUCTIBLES AND SELF-INSURED RETENTIONS.

Any deductibles or self-insured retentions must be declared to and approved by the Owner. If approved at the option of the Owner, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the Owner, its officers, officials, employees and volunteers; or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expense.

E. OTHER INSURANCE PROVISIONS.

The policies are to contain, or be endorsed to contain, the following provisions:

1. Fire Insurance / Builders Risk Insurance.

    a. The Contractor shall secure "All Risk" type Builder's Risk Insurance for the Work to be performed pursuant to this Agreement. The policy shall cover not less than losses due to fire, explosion, vehicle damage, theft, flood, earthquake and civil commotion with no coinsurance penalty provision.

    b. The Contractor shall obtain and keep in force insurance against loss or damage by fire and the customary extended perils including windstorm, hail, explosion, aircraft, vehicle, smoke, riot, and civil commotion, vandalism, sprinkler leakage (including earthquake) as covered under the standard forms of California Standard Fire Insurance Policy for school projects or Factory Insurance Association and/or Factory Mutual Insurance Company for projects other than schools. The policy shall cover the entire structure on which the work of this contract is to be done, up to the full insurable value thereof, including items of labor and materials connected therewith on the site, materials in place or to be used as part of the permanent construction including materials stored and partially paid for by the Owner as provided in Section 00 21 13 surplus materials, shanties, protective fences, bridges, or temporary structures, miscellaneous materials and supplies incident to the work, and such scaffolding, staging, towers, forms and

equipment as are not owned or rented by the Contractor, the cost of which is included in the cost of the work. EXCLUDED: This insurance does not cover any tools owned by mechanics, any tools, equipment, scaffolding, staging, towers, and forms owned or rented by the Contractor, the capital value of which is not included in the cost of the Work, or any structures erected for the Contractor's administration of the Project. The loss, if any, is to be adjustable with and payable to the Owner as trustee for the insured as their interests may appear, except in such cases as may require payment of all or a proportion of said insurance to be made to a mortgagee or trustee as its interest may appear.

c. The Owner shall be named as insured jointly with the Contractor and other proper parties, all as their respective interests may appear. All subcontractors shall be insured to the extent of their portion of the work under the Contractor. The Owner, Contractor and all subcontractors waive all rights, each against the others, for damages caused by fire or other perils covered provided under the terms of this article, except such rights as they may have to the proceeds of the insurance held by the party obtaining and maintaining the insurance policy in force who acts as trustee of said policy. Certificates of such insurance shall be filed with the Owner. If the Contractor fails to effect or maintain insurance as above and so notifies the Owner, the Owner may insure his own interest and charge the cost thereof to the Contractor.

d. In the event of a partial or total destruction by the perils insured against, of any or all of the work and/or materials herein provided for, at any time prior to the final completion of the Contract and the final acceptance by the Owner of the Work or materials to be performed or supplied thereunder, the Contractor shall promptly reconstruct, repair, replace, or restore all work or materials so destroyed or injured at his sole cost and expense. Nothing herein provided for shall in any way excuse the Contractor or his surety from the obligation of furnishing all the required materials and completing the work in full compliance with the terms of the Contract.

2. Commercial General Liability and Automobile Liability Coverages.

a. The Contractor shall secure Commercial General Liability Insurance with limits of not less than One Million Dollars ($1,000,000.00) per occurrence and an annual aggregate of Three Million Dollars ($3,000,000.00). This policy shall be issued on a per occurrence basis. The Owner may require specific coverage including completed operations, product liability, contractual liability, XCU, fire legal liability or any other liability insurance deemed necessary because of the nature of the contract. The Owner, its officers, officials, employees, agents, including Consulting Engineers while performing contract administration services, and volunteers are to be covered as insured as respects all of the following**:** liability arising out of activities performed by or on behalf of the Contractor, including the insured's general supervision of the Contractor; products and completed operations of the Contractor; premises owned, occupied or used by the Contractor; or automobiles owned, leased, hired or borrowed by or on behalf of the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to the Owner, its officers, officials, employees or volunteers.

b. The Contractor's insurance coverage shall be primary insurance as respects the owner, its officers, officials, employees, agents, Consulting Engineers, and volunteers. Any insurance or self-insurance maintained by the Owner, its officers, officials, Employees, agents, Consulting Engineers, or volunteers shall be in excess of the Contractor's insurance and shall not contribute with it.

c. Any failure to comply with reporting provisions of the policies shall not affect Coverage provided to the Owner, its officers, officials, employees, agents, Engineers, Consulting Engineers, or volunteers.

d. The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

e. Such Commercial General Liability insurance shall name the County of MONO, its officers, agents, and employees, individually and collectively, as additional insured, but only insofar as the operations under this Agreement are concerned. Such coverage for additional insured shall apply as primary insurance and any other insurance, or self-insurance, maintained by Owner, its officers, agents and employees shall be excess only and not contributing with insurance provided under Contractor's policies herein. This insurance shall not be cancelled or changed without a minimum of thirty (30) days advance written notice given to Owner. Contractor shall obtain endorsements to the Commercial General Liability insurance policy naming Owner as an additional insured and providing for a thirty (30) day prior written notice of cancellation or change in terms or coverage

f. Comprehensive Automobile Liability Insurance with limits of not less that One Million Dollars ($1,000,000) per accident for bodily injury and property damage. Coverage should include owned and non-owned vehicles used in connection with this Agreement and all applicable endorsements.

3. Professional Liability Coverage.

   If Contractor employs licensed professional staff, (*e.g., P.E., P.L.S.*, R.N., L.C.S.W., M.F.C.C.) in providing services, the Contractor shall secure Professional Liability Insurance with limits of not less than one million dollars ($1,000,000.00) per occurrence, and three million dollars ($3,000,000.00) annual aggregate, with a provision for three (3) year tail coverage.

4. Worker's Compensation and Employers Liability Coverage.

   The Contractor shall obtain a policy of Worker's Compensation insurance in accordance with applicable provisions of the California Labor Code. The insurer shall agree to waive all rights of subrogation against the Owner, its officers, officials, employees and volunteers for losses arising from work performed by the Contractor for the Owner. Contractor shall supply the Owner with certificates of insurance in triplicate, evidencing that Workers Compensation Insurance is in effect and providing that the Owner will receive 30 days' notice of cancellation. If Contractor self-insures Workers Compensation, Certificate of Consent to Self-Insure shall be provided to the Owner.

5. All Coverages.

Prior to the commencement of performing its obligations under this Agreement, Contractor shall provide certificates of insurance and upon request from Owner, formal endorsements for the foregoing policies, as required herein, to the Owner, listing the name and address of the official who will administer this contract, and stating that such insurance coverage have been obtained and are in full force; that the County of MONO, its officers, agents and employees will not be responsible for any premiums on the policies; that such Commercial General Liability insurance names the County of MONO, its officers, agents and employees, individually and collectively, as additional insured, but only insofar as the operations under this Agreement are concerned; that such coverage for additional insured shall apply as primary insurance and any other insurance, or self-insurance, maintained by Owner, its officers, agents and employees, shall be excess only and not contributing with insurance provided under Contractor's policies herein; and each insurance policy required by this Section 2.40 shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty (30) days' prior written notice has been given to the Owner.

F. ACCEPTABILITY OF INSURERS

Contractor shall obtain the policies and coverages specified herein from an admitted insurer in good standing with and authorized to transact business in this state by the California Department of Insurance, and having a Best's rating of no less than **A** and FSC **VIII**.

G. VERIFICATION OF COVERAGE

Contractor shall furnish the Owner with certificates of effecting coverage required by this clause. The certificates for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf. All certificates are to be received and approved by the owner before work commences. The Owner reserves the right to require complete, certified copies of all required insurance policies, at any time. In the event Contractor fails to keep in effect at all times insurance coverage as herein provided, the Owner may, in addition to other remedies it may have, suspend or terminate this Agreement upon the occurrence of such event. The Certificate of Insurance shall be issued in triplicate, and provided to the Owner within ten (10) days of award, and also shall be provided to all other participating agencies who contribute to the cost of the work or have jurisdiction over areas in which the work is to be performed and all officers and employees of said agencies while acting within the course and scope of their duties and responsibilities.

H. SUBCONTRACTORS

Contractor shall include all Subcontractors as insured under its policies or shall furnish separate certificates and endorsements for each Subcontractor. All coverages for Subcontractors shall be subject to all of the requirements stated herein.

2.41 UNCOVERING WORK

A. If any portion of the Work should be covered contrary to the request of the CM, IOR, Owner, public authority having jurisdiction, or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Engineer, be uncovered for their observation and shall be replaced at the Contractor's expense.

B. If any other portion of the Work has been covered which the Engineer, Owner or public authority having jurisdiction has not specifically requested to observe prior to its being covered, the Engineer may request to see such Work and it shall be uncovered by the Contractor. If such Work is found in accordance with the Contract Documents, the cost of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work is found not in accordance with the Contract Documents, the Contractor shall pay such costs unless it be found that this condition was caused by the Owner or a separate contractor as provided herein in these General Conditions, in which event the Owner shall be responsible for the payment of such costs.

2.42 CORRECTION OF WORK

A. The Contractor shall promptly correct all Work rejected by the Engineer as defective or as failing to conform to the Contract Documents, whether or not fabricated, installed or completed. The Contractor shall submit a plan of action, within twenty-four (24) hours of notification of the rejected work by the Engineer, for correcting the rejected work. The Contractor shall bear all costs of correcting such rejected Work, including compensation for the Engineer's and Architect's additional services made necessary thereby.

B. If, within one (1) year after the date of acceptance of the Work as specified in the Notice of Completion, or designated portion thereof, or within one (1) year after acceptance by the Owner of designated equipment, or within such longer period of time as may be prescribed by the terms of any applicable special warranty required by the Contract Documents, any of the Work is found by Owner to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. This obligation shall survive both final payment for the Work or designated portion thereof and termination of the Contract. The Owner shall give such notice promptly after discovery of the condition.

C. C. The Contractor shall, at his/her sole expense, remove from the site all portions of the Work that are defective or nonconforming and which have not been corrected under Articles 2.32, 2.42.A, and 2.42.B, unless the Owner waives removal.

D. If the Contractor fails to submit a plan of action, within twenty-four (24) hours of notification of the rejected work by the Engineer, for correcting the rejected work, or fails to correct defective or nonconforming Work as provided herein in Articles 2.32, 2.42.A, and 2.42.B, the Owner may correct it in accordance with Article 2.08.C.

E. If the Contractor does not take action under the plan to initiate such correction of such defective or nonconforming Work within ten (10) days of written notice from the Engineer, the Owner may remove it and may store the materials or equipment at the expense of the Contractor. If the

Contractor does not pay the cost of such removal and storage within ten (10) days thereafter, the Owner may, upon ten (10) additional days' written notice, sell such Work at auction or at private sale and shall account for the proceeds thereof, after deducting all the costs that should have been borne by the Contractor, including compensation for the CM, IOR, Architect, or other Professional's additional services made necessary thereby. If such proceeds of sale do not cover all costs that the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

F. The Contractor shall bear the cost of making good all work of the Owner or separate contractors destroyed or damaged by such correction or removal.

G. Nothing contained in this Article 2.42 shall be construed to establish a period of limitation with respect to any other obligation which the Contractor might have under the Contract Documents, including Article 2.32 hereof. The establishment of the time periods noted in this Article 2.42, or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents, relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the Contractor's obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

2.43 ACCEPTANCE OF DEFECTIVE OR NONCONFORMING WORK

If the Owner prefers to accept defective or nonconforming Work, the Owner may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect a reduction in the Contract Amount where appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made. Engineer shall determine the amount of reduction in the Contract Amount.

2.44 TERMINATION BY THE OWNER

A. If the Contractor is adjudged bankrupt, or makes a general assignment for the benefit of creditors, or if a receiver is appointed on account of the Contractor's insolvency, or stop notices are served upon the Owner, or if the Contractor persistently or repeatedly refuses or fails, except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials, or fails to make prompt payment to Subcontractors or for materials or labor, or persistently disregards applicable laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, or otherwise is guilty of a substantial violation of a provision of the Contract Documents, and fails after written notice to commence and continue correction of such default, neglect or violation with diligence and promptness, the Owner upon certification by the Engineer that sufficient cause exists to justify such action, may, after an additional written notice and without prejudice to any other remedy the Owner may have, terminate the Contract and take possession of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor and may finish the Work by

whatever methods the Owner may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the Work is finished.

B. If the unpaid balance of the Contract Amount exceeds the costs of finishing the Work, including compensation for the CM's, IOR's and Architect's additional services made necessary thereby, Contractor will only be paid for his/her actual unpaid costs from such excess. If such costs exceed the unpaid balance, the contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or to the Owner, as the case may be, shall be certified by the Engineer, upon application, in the manner provided in Article 2.24 and this obligation for payment shall survive the termination of the Contract.

2.45 SUBSTITUTION OF MATERIALS

A. When a specific manufacturer, trade name or material is specified, or indicated, it is to establish a standard of quality and shall not be construed as limiting competition. The intent of the Contract Documents is to specify high-grade standard material and equipment, and it is not the intent of these Contract Documents to exclude or omit the products of any responsible manufacturer, if such products are equally acceptable in terms of quality, finish, performance, durability, and serviceability, in the judgment of the Owner and the Architect, to those specified herein. Wherever an article, or any class of materials, is specified by the trade name or by the name of any particular patentee, manufacturer or dealer, it shall be taken as intending to mean and specify the article of material described or any other equal thereto in quality, finish, performance, durability, and serviceability, in the judgment of the Owner and the Architect, for the purpose for which it is or they are intended.

B. If the Contractor desires to use material or equipment other than that specified, he/she shall submit a request for approval of such substitution, using the form provided, to the Architect/Engineer by no later than the date stipulated in document 01 25 00.

C. The Owner does not guarantee that alternative articles, components, materials or equipment other than the item specified by trade name or other specific identification, will fit within the design parameters of the project without alteration of the project design by the Contractor.

D. The Owner has the right to reject any proposed alternative material which requires alteration of the project design which impacts the safety of the public or the user of the completed facility. If the proposed alternative material requires alteration of the design of the Project or any aspect thereof and said alterations are acceptable to the Owner, the Contractor shall be responsible for performing said alterations at no additional cost to the Owner.

E. Submittals for approval of substitute materials shall contain sufficient detailed information, descriptive brochures, drawings, samples or other data as is necessary to provide a detailed side-by-side comparison to the specified materials. It is the sole responsibility of the Contractor to submit complete descriptive and technical information so the Engineer and the Architect can make proper appraisal. Lack of either proper or sufficient information shall constitute cause for rejection. Reference to product data will not be acceptable.

F. It is the Contractor's responsibility to confirm and correlate all quantities and dimensions and coordinate with all trades whose work may be affected by the requested substitution.

2.46 REFERENCE TO STANDARDS

A. Reference to known standards shall mean and intend the latest edition or amendment published prior to date of these Specifications, unless specifically indicated otherwise, and to such portions of it that relate and apply directly to the material or installation called for on the Project.

B. Where material is specified solely by reference to standard specifications, the Contractor shall, if requested by the Engineer, submit to the Engineer for his/her approval, data on all such material proposed to be incorporated into the Work of the Contractor, listing the name and address of the vendor, the manufacturer or producer, and the trade or brand names of such materials.

2.47 SPECIFICATIONS

A. The Specifications are organized into Divisions, Sections, and Trade headings based on the Construction Specifications Institute's 49-Division format and the Master format numbering system. This organization shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of the Work to be performed by any trade. The Contractor shall be responsible for examining all Sections of the Specifications for inter-related items of the Work, and for furnishing each item identified or specified.

B. No responsibility will be assumed by the Owner, Architect or the CM for omissions or duplications by the Contractor in the completion of the Contract due to any alleged discrepancy in the arrangement of the material in these Specifications, nor shall any such segregation of work and materials operate to make the IOR an arbiter in defining the limits to the agreements between the Contractor and his/her Subcontractors or suppliers.

C. The misplacement, addition or omission of any letter, word or punctuation mark shall in no way damage the true spirit, intent or meaning of these Specifications.

D. The words "shown", "indicated", "noted", "scheduled" or words of that effect shall be understood to mean that reference is made to the Drawings accompanying these Specifications.

E. Where reference herein is made to colors or finishes "as selected", the reference is to the Architect with concurrence by the Owner.

2.48 APPROVED APPLICATORS

A. Where specific instructions in these Specifications require that a particular product and/or materials be installed and/or applied by an "approved applicator" of the manufacturer, it shall be the Contractor's responsibility to insure that any Subcontractors used for such work be approved applicators.

B. Contractor accordingly shall bear any and all costs, and shall reimburse Owner for any such costs incurred by Owner, resulting from Contractor's failure to insure the use of an "approved applicator".

2.49 DELIVERY AND STORAGE OF MATERIALS

A. Deliver all manufactured materials in the original packages, containers or bundles (with the seals intact), bearing the name or identification mark of all manufacturer

B. Deliver fabrications in as large assemblies as practicable and where specified to be shop-primed or shop-finished; they shall be packaged or crated as required to preserve such priming or finish intact and free from abrasion.

C. Store all materials in such manner as necessary to properly protect same from damage, as materials or equipment damaged by handling, weather, dirt or from any other cause will not be acceptable.

D. Store materials so as to cause no obstructions (i.e. stored off all sidewalks and other walkways, roadways, and underground services). The Contractor shall be responsible for protecting from damage all material and equipment furnished under the Contract.

2.50 QUALITY OF WORK

A. Where not more specifically described in any of the various Sections of these Specifications, the quality of work shall conform to all of the methods and operations of best standards and accepted practices of the trade or trades involved, and shall include all items of fabrication, construction, or installation regularly furnished or required for completion of the work (including any finish), and for successful operation as intended of the project and the component thereof corresponding to that work.

B. All Work shall be executed by mechanics skilled in their respective lines of work.

C. When completed, all parts shall have been durably and substantially built and shall present a neat, finished appearance.

2.51 HOURS OF WORK

A. Eight (8) hours of labor shall constitute a legal day's work upon all work done hereunder, and it is expressly stipulated that no worker employed at any time by the Contractor, or by a Subcontractor under this Contract, upon the Work, shall be required or permitted to work thereon more than eight (8) hours in any one (1) calendar day and forty (40) hours in any one (1) calendar week, except as provided in Sections 1810-1815 inclusive, of the Labor Code of the State of California, all the provisions of which are deemed to be incorporated herein as if set forth in full; and it is further expressly stipulated that for each and every violation of said last named stipulation, said Contractor shall forfeit, as a penalty to the Owner, fifty dollars ($50.00) for each worker employed by the Contractor in the execution of this Contract, for each calendar day during which said worker is required or permitted to labor more than eight (8) hours in any one (1) calendar day and forty (40) hours in any one (1) calendar week in violation of any of said provisions of the Labor Code.

B. Notwithstanding the above stipulations, pursuant to Section 1815 of the Labor Code, work performed by employees of contractors in excess of eight (8) hours per day and forty (40) hours during any one (1) week shall be permitted on the Project upon compensation for all hours worked in excess of eight (8) hours per day at not less than one and a half (1 1/2) times the basic rate of pay.

2.52 WAGE RATES

A. Pursuant to Section 1770-1780 of the Labor Code of the State of California, the Director of the Department of Industrial Relations has determined the general prevailing rates of wages and rates for legal holidays and overtime in the locality in which this work is to be performed, which under Labor Code Section 1773.1 are deemed to include employer payments for health and welfare, pension, vacation, travel time and subsistence pay, and apprenticeship or other authorized training programs, for each craft or type of worker or mechanic needed to perform this contract. Said wage rates are available only at the Mono County Department of Public Works, and will be made available to any interested person upon request. Minimum wage rates for this Project, as predetermined by the Secretary of Labor, are set forth in the Special Provisions. If there is a difference between the minimum wage rates predetermined by the Secretary of Labor and the Prevailing Wage Rates predetermined by the Director of the Department of Industrial Relations of the State of California for similar classifications of labor, the contractor and his subcontractors shall pay not less than the higher wage rate.

B. It shall be mandatory upon the Contractor to whom the Contract is awarded, and upon any Subcontractor under him/her to pay not less than the said specified rates to all laborers, workers, and mechanics employed by them in the execution of the Contract, and to pay all laborers, workers and mechanics not less often than once weekly. The Contractor to whom the Contract is awarded shall post a copy of the determination of prevailing wages at the job site. The Contractor shall require all Subcontractors to comply with Sections 1770-1780 of the Labor Code of the State of California and shall insert into every subcontract the requirements contained therein.

C. The Contractor shall comply with Labor Code Section 1775. In accordance with said Section 1775, it is hereby further agreed that the Contractor shall forfeit to the Owner, as a penalty, fifty dollars ($50.00) for each laborer, worker, or mechanic employed for each calendar day or

portion thereof, who is paid less than the said stipulated rates for any work done under the Contract, by him/her or by any Subcontractor under him/her. The difference between said stipulated rates and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than said stipulated rate shall be paid to each worker by the Contractor. The Contractor, and each Subcontractor, shall keep or cause to be kept an accurate record showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker or other employee employed by him/her or her in connection with the public work. The records shall be open at all reasonable hours to the inspection of the Owner, to its officers and agents, and to the Division of Labor Law Enforcement of the State Department of Industrial Relations, its deputies and agents, or as otherwise provided by applicable law (including but not limited to Labor Code 1776).

D. In case it becomes necessary for the Contractor or any Subcontractor to employ on the Work under this Contract any person in a trade or occupation (except executive, supervisory, administrative, clerical or other non-manual workers as such) for which no minimum wage rate is specified, the Contractor shall immediately notify the Owner who shall promptly thereafter determine the prevailing rate for such additional trade or occupation from the time of the initial employment of the person affected and during the continuance of such employment.

2.53 APPLICATION OF HIGHEST STANDARDS AND REQUIREMENTS

Whenever two (2) or more standards or requirements appear in these General Conditions or in any other part of the Contract Documents that form the Contract, the highest standard or requirement shall be applied and followed in the performance under this Contract.

2.54 NONDISCRIMINATION IN EMPLOYMENT

A. Federal and State Laws prohibit discrimination in employment. The California Fair Employment Practices Act (Labor Code Section 1410 to 1433) prohibits discrimination in employment on the basis of race, religion, color, sex, physical handicap, medical condition, marital status, age, national origin or ancestry, and applies to all employers, employment agencies and labor organizations.

B. Title VII of the Federal 1964 Civil Rights Act (42 U.S.C. Section 2000e - 2000e - 17) prohibits employment discrimination on the basis of race, color, sex, religion, or national origin, and applies to all employers that employ at least fifteen (15) workers during each working day in each of twenty (20) or more calendars weeks in the current or preceding year.

C. In addition to these two (2) laws of general application, there are other Federal and State laws that prohibit employment discrimination in particular cases.

D. The Owner is an Affirmative Action Employer and expects all of its contractors and suppliers to familiarize themselves with, and comply with, all applicable laws relating to employment discrimination.

E. To the extent required by law, the Contractor shall meet all requirements of law relating to the participation of minority, women, and disabled veteran business enterprise contracting goals, and shall comply with Public Contract Code 10115 et seq. and all applicable regulations. Contractor further agrees that, when required, Contractor shall ensure compliance by all Subcontractors and shall complete all forms required by all agencies exercising jurisdiction over the project.

2.55 APPRENTICES

A. Pursuant to Sections 1770-1780 of the Labor Code of the State of California, the Director of the Department of Industrial Relations has determined the general prevailing rate of wages in the locality for each craft or type of worker needed to execute the work. Said wage rates pursuant to Section 1773.2 of the Labor Code are on file with the Clerk to the MONO County Board of Supervisors, and will be made available to any interested person on request. A copy of this wage scale may also be obtained at the following Web Site: *www.dir.ca.gov/dlsr*.

B. Pursuant to Section 1775 of the Labor Code of the State of California, nothing in this Article shall prevent the employment of properly registered apprentices upon public works. Every such apprentice shall be paid the standard wage paid to apprentices under the regulations of the craft or trade at which he/she is employed, and shall be employed only at the work of the craft or trade to which he/she is registered.

C. Only apprentices, as defined in Section 3077, who are in training under apprenticeship standards and written apprentice agreements under Chapter 4 (commencing at Section 3070), Division 3, of the Labor Code, are eligible to be employed on public works. The employment and training of each apprentice shall be in accordance with the provisions of the apprenticeship standards and apprentice agreements under which he/she is training.

D. Mono County is committed to increasing the availability of employment of employment and training opportunities, with particular attention to the plight of those who are most economically disadvantaged. In an effort to advance that purpose, the County will require that the Contractor and each subcontractor employed on this Project shall use their best efforts to ensure that thirty-three percent (33%) of apprentice hours, as determined by California Labor Code Section 1777.5 for each contractor and subcontractor of any tier on this Project are performed by qualified participants in the state approved apprenticeship programs who also are current or former “Welfare-to-Work” participants in the CalWORKs program. Provided, that nothing contained in this Paragraph D shall be interpreted to relieve or in any way diminish the obligation of the Contractor and each subcontractor to comply fully with all applicable apprenticeship laws in accordance with the California Labor Code and the California Code of Regulations; and accordingly such requirements as are contractually imposed by this Paragraph D shall be in addition to such legally mandated requirements, and applicable only to the extend fully consistent therewith.

E. Incentives whereby the Contractor or Subcontractor receives partial reimbursement for the wages paid to apprentices who qualify may be available. The incentive program is administered by the County of MONO, Department of Social Services. For questions regarding the incentive program, contact the Department of Social Services at (559) 600-5370.

2.56 PROVISIONS REQUIRED BY LAW DEEMED INSERTED

Every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted, and this contract shall be read and enforced as though it were included, and if through mistake or otherwise any provision is not inserted or is not correctly inserted, upon application of either party the contract shall be amended to make the insertion or correction.

2.57 DRUG FREE WORKPLACE CERTIFICATION

A. The Contractor shall comply with Government Code Section 8355 in matters relating to providing a drug-free workplace.

B. The Contractor shall publish a statement notifying employees that unlawful manufacture, distribution, dispensation, possession, or use of controlled substance is prohibited and specifying actions to be taken against employees for violations, as required by Government Code Section 8355(a).

C. The Contractor shall establish a Drug-Free Awareness Program as required by Government Code 8355(b), to inform employees about all of the following:

   1. The dangers of drug abuse in the workplace,

   2. The Contractor's policy for maintaining a drug-free workplace,

   3. Any available counseling, rehabilitation and employee assistance programs,

   4. Penalties that may be imposed upon employees for drug abuse violations.

D. Provide as required by Government Code 8355(c), that everyone who provides work under the Agreement.

   1. Will receive a copy of the company's drug-free policy statement, and

   2. Will agree to abide by the terms of the Contractor's statement as a condition of employment on the contract.

2.58 PROJECT BOOKS AND RECORDS

A. The Contractor shall maintain adequate fiscal and Project books, records, documents and other evidence pertinent to the Contractor's work on the Project in accordance with generally accepted accounting principles. Adequate supporting documentation shall be maintained in such detail so as to permit tracing transactions from the invoices, to the financial statement, to the accounting records and to the supporting documentation. All of the Contractor's records contained in the official project file must be preserved for a minimum of three years after the last

date on which no lease revenue bonds are outstanding. If any litigation, claim, negotiation, audit, or other action involving the records has been started before the expiration of the relevant time period as set forth in the previous sentence, the related records must be retained until the completion of the action and resolution of all issues which arise from it if such date is later than the end of the aforementioned three-year period. These records shall be protected from fire and other damage.

B. The Contractor's Project books, records, documents and other evidence pertinent to the Contractor's work on the Project shall be subject to inspection, examination, monitoring, copying, excerpting, transcribing, and/or audit by the County or designees, the Board of State and Community Corrections (BSCC) or designees, The Department of Corrections and Rehabilitation or designees, the Department of General Services or designees, the Department of Finance or designees, the Bureau of State Audits or designees, and state government auditors or designees for a minimum of three years after the last date on which no lease revenue bonds are outstanding. If any litigation, claim, negotiation, audit or other action involving the records has been started before the expiration of the relevant time period as set forth in the previous sentence, the related records must be retained until the completion of the action and resolution of all issues which arise from it if such date is later than the end of the aforementioned three-year period. Suitable facilities for access, monitoring, inspection and copying thereof shall be provided to any of the parties listed above.

C. The Contractor is advised that a partial source of financing for this agreement for construction of the Project is the State SB 1022 financing, and that the County may not have funds to finance this agreement independently of the State financing. The Contractor shall in all ways cooperate with the County and BSCC in maintaining a positive, good working relationship focused on what is best for the Project.

2.59 PARTNERING

Partnering sessions shall be a part of this contract. A one-day initial session, one-day group session and quarterly refresher sessions are planned. The sessions shall be attended by all associated project and executive level staff requested by the County at no additional cost to the County. Dates for these sessions are to be determined. These sessions are planned to be held at the Mono County Public Works Conference Room on the 2nd floor 74 North School Street, Bridgeport, 93517 and are subject to change. The professional facilitator costs will be borne by the Owner.

END OF GENERAL CONDITIONS

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SUPPLEMENTAL GENERAL CONDITIONS

3.01 GENERAL

The foregoing Supplemental General Conditions shall form a part of this section with the same force and effect as though repeated herein.

Attention is also directed to Division 01 - GENERAL REQUIREMENTS.

It is the contractor's responsibility to obtain hard copies of the contract documents if needed.

3.02 PRE-BID CONFERENCE

A pre-bid conference will be held at the time and date stated on the cover sheet. A discussion of the project will be held and the project site will be open for examination. Contractors should meet at the project site:

221 Twin Lakes Road, Bridgeport, California 93517.

3.03 PERMITS AND LICENSES

Project required Permits will be provided by the Owner:

Grading Permit
Building Permit
Encroachment Permit

Project required Permits to be obtained by Contractor:

Mono County Business License
Air quality permit from Great Basin Air Quality Control District as needed for operation of generators and/or equipment
Storm Water Construction General Permit SWPPP

3.04 CODES AND REGULATIONS

All work, materials, and equipment shall be in full compliance with the 2013 edition of the California Code of Regulations, Title 24, Parts 2,3,4,5,6 & 9, NFPA, Cal/OSHA Safety Regulations; and all Federal, State and Local laws, ordinances, regulations, applicable in the performance of the work.

3.05 COORDINATION OF WORK

The Contractor shall coordinate all work with Public Works and Planning Construction Supervisor (760-709-0423), to minimize any interruptions to the normal operation of the existing facilities particularly interruptions to utilities, HVAC, normal & emergency electrical power, alarm system, communications system, and computer systems.

3.06 WORK DAY NOISE

All work shall be in accordance with the Mono County Code of Ordinances, 10.16.060 - Noise level limitations, paragraph C.

Exterior noise creating activities including but not limited to engine starts, material loading, material dumping, site work, earthwork, structure construction, backup alarms, shouting, etc. shall be performed during the regular work week, and between the hours of 8:00 AM – 6:00 PM. Quiet activities, and interior work that the Engineer cannot hear from property lines may be permitted outside of the above working hours on a case-by-case basis by the Engineer.

No amplified music is allowed. Amplified music may be allowed by the Engineer during interior work, provided it cannot be heard from property lines.

3.07 SCHEDULE OF OPERATION

Time is of the essence in the performing of this contract. The Contractor shall generally schedule the work in a manner that will progress to completion without interruption.

3.08 TEMPORARY FACILITIES - See Section 01 50 00

3.09 FIRE PROTECTION AND FIRE INSURANCE

Contractor shall not perform any fire hazardous operation adjacent to combustible materials. Any fire hazardous operation shall have proper fire extinguisher close by and the adjacent area shall be policed before stopping work for the day.

Contractor shall provide not less than one OSHA / NFPA Class 6-ABC fire extinguisher for each 9,000 square feet of project area or fraction thereof.

3.10 DAMAGE TO EXISTING WORK

Damage to existing construction, equipment, planting, public roads, fences, utilities etc., by the Contractor in the performance of his work shall be replaced or repaired and restored to original condition by the Contractor at the Contractor's expense. The Contractor will be responsible for the restoration of the Contractor Laydown Area prior to the Notice of Substantial Completion.

3.11 PROTECTION OF ALARM, SECURITY, COMMUNICATIONS, AND COMPUTER SYSTEMS

The Contractor shall be responsible for all costs incurred by the Owner on these systems as a result of work by the Contractor or damage caused by the Contractor's operations, including costs associated with false fire alarms caused by Contractor operations.

3.12 RECORD DRAWINGS – SEE SECTION 01 78 00

The Contractor shall be required to provide a complete set of paper as-builts including full size drawings and specifications. One set shall be maintained on-site and reserved upon which a record of all changes to the project plans shall be made. As the work progresses, the Contractor will be responsible for and shall maintain a record of all deviations in the mechanical, electrical, plumbing and other work from that indicated on the plans. As a condition for considering the project complete, the record drawings must be delivered to the Architect of Record, and deemed acceptable. Provisions in sections 01 29 00 – Payment Procedures and 01 32 26 Construction Progress Documentation shall be strictly enforced and will result in additional retention withholdings from requests for progress payment if documentation is not kept current.

3.13 GUARANTEE / WARRANTY RESPONSE

Attention is directed to Section 00 72 00 - General Conditions, section 2.32 "Guarantee Of Work", the Section 00 65 36 - Guaranty, and Section 01 78 36 "Warranties and Bonds" of the Specifications.

In lieu of any time limits imposed or implied by the above referenced contract documents or stated in standard product warranties or special warranties, the Contractor shall respond within 24 hours to notice from the Owner that repairs or changes are required in connection with guaranteed work or equipment within the guarantee period.

3.14 TRENCHING AND EXCAVATION

In accordance with Section 7104 of the California Public Contract Code, the following provisions shall apply to any contract involving digging of trenches or other excavations that extend deeper than five feet below the surface:

A. The contractor shall promptly, and before the following conditions are disturbed, notify the Owner, in writing, of any:

   1. Material that the contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.

   2. Subsurface or latent physical conditions at the site differing from those indicated.

   3. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract.

B. The Owner shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the

contractor's cost of, or the time required for, performance of any part of the work, shall issue a change order in accordance with the provisions of Section 2.11 of the General Conditions.

C. In the event that a dispute arises between the Owner and the contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the contractor's cost of, or time required for, performance of any part of the work, the contractor shall not be excused from any scheduled completion date provided for by the contract, but shall proceed with all work to be performed under the contract. The contractor shall retain any and all rights provided either by contract or by law which pertain to the resolution of disputes and protests between the contracting parties.

D. In advance of any excavation the Contractor shall submit to the Construction Manager a detailed plan showing the design of shoring, bracing, sloping or other provisions to be made for worker protection from the hazard of caving ground during the excavation of any trench or trenches five feet or more in depth. A registered civil or structural engineer shall prepare the plan. As part of the plan, a note shall be included stating that the registered civil or structural engineer certifies that the plan complies with CAL-OSHA Construction Safety Orders, or stating that the registered civil or structural engineer certifies that the plan is not less effective than the shoring, bracing, sloping, or other provisions of the Safety Orders.

1. All shoring submittals shall include surcharge loads from adjacent embankments, construction loads and spoil bank. Submittal shall indicate minimum horizontal distance from top of trench to edge of all surcharge loads for all cases of shoring and side slopes.

2. Nothing in this Section shall relieve the Contractor of the full responsibility for providing shoring, bracing sloping, or other provisions adequate for worker protection. If such plan varies from the shoring system standards established by the Construction Safety Orders, a registered civil or structural engineer shall prepare the plan. No excavation of such trench or trenches shall be commenced until said plan has been accepted by the Owner or the person to whom authority to accept such plan has been delegated.

3.16 ABNORMAL WEATHER CONDITIONS

A. The contractor shall provide a Notice of Impact and a schedule fragnet submittal to the Construction Manager for all time extension requests due to abnormal weather conditions. Should the Contractor fail to provide Notice of Impact and/or a schedule fragnet submittal for the weather event within (10) ten calendar days of the first delay day, then it is mutually agreed that the weather event has no time impact on the contract completion date and not time extension is required. If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the scheduled construction as illustrated by schedule fragnet.

B. A snow, rain, windstorm, high water or other natural phenomenon of the specific locality of the work, which might reasonably have been anticipated from historical records of the general locality of the work, shall not be construed as abnormal weather conditions. The contractor shall anticipate the effect of the following rainfall totals provided by the Western Regional

Climate Center during the development of the Project Schedule. No allowance for weather related contract time extensions will be considered until the following monthly totals have been surpassed and the adverse weather must have actually caused a delay in the completion of the project.

Avg. Total Precipitation (in.)/Month			
JAN	4.2	JUL	0.5
FEB	3.5	AUG	0.4
MAR	2.8	SEP	0.4
APR	1.6	OCT	1.1
MAY	1.2	NOV	2.0
JUN	0.5	DEC	3.9

3.18 ESCROW BID DOCUMENTS

A. SCOPE

1. The apparent low Bidder shall submit, within ten (10) days after the day of bid opening, one (1) copy of all documentary information generated in preparation of bid price for this Project. This material is hereinafter referred to as "Escrow Bid Documents." The Escrow Bid Documents of the successful Bidder will be held in escrow for the duration of the Contract. The second and third low bidders shall be prepared to submit Escrow Bid Documents upon request of the Owner.

2. The successful Bidder agrees, as a condition of award of the Contract, that the Escrow Bid Documents constitute all of the information used in preparation of the bid, and that no other bid preparation information will be considered in resolving claims.

3. Nothing in the Escrow Bid Documents shall change or modify the term or conditions of the Contract.

4. If the Bidder's proposal is based on subcontracting any part of the Work, each subcontractor, whose total subcontract price exceeds the lesser of two percent of the total contract price proposed by the Bidder, or $10,000, shall provide separate Escrow Bid Documents to be submitted with those of the Bidder. These submittals will be examined in the same manner and at the same time as the examination for the apparent successful Bidder.

B. PURPOSE

Escrow Bid Documents will be used to assist in the negotiation for the settlement of claims. They will not be used for pre-award evaluation of the Bidder's anticipated methods of construction or to assess the Bidder's qualification for performing the work.

C. OWNERSHIP AND CONFIDENTIALITY

1. The Escrow Bid Documents are and will always remain the property of the Bidder, subject only to joint review by the Owner, the Construction Manager, and the Contractor.

2. The Owner stipulates and expressly acknowledges that the Escrow Bid Documents constitute trade secrets, and are proprietary and confidential. This acknowledgement is based on the Owner's express understanding that the information contained in the Escrow Bid Documents is not known outside the Bidder's business, is known only to a limited extent and only by a limited number of employees of the Bidder, is safeguarded while in Bidder's possession, is extremely valuable to Bidder, and could be extremely valuable to Bidder's competitors by virtue of it reflecting the bidder's contemplated techniques of construction. Owner acknowledges that the Bidder expended substantial sums of money in developing the information included in the Escrow Bid Documents and further acknowledges that it would be difficult for a competitor to replicate the information contained herein. Owner further acknowledges that the Escrow Bid Documents and the information contained herein are made available to Owner only because such action is an essential element of the Bidder's responsibility. Owner acknowledges that the Escrow Bid Documents include a compilation of information used in the Bidder's business, intended to give the Bidder an opportunity to obtain an advantage over competitors who do not know of or use the contents of the documentation.

3. Owner agrees to safeguard the Escrow Bid Documents and all information contained herein, against disclosure to the fullest extent permitted by law.

D. FORMAT AND CONTENTS

1. Bidders may submit Escrow Bid Documents in their usual cost-estimating format. Escrow Bid Documents shall be adequate to enable complete understanding and proper interpretation for their intended use.

2. Escrow Bid Documents shall clearly itemize the estimates costs of performing the work. Items shall be separated into sub-items as required to present a complete and detailed cost estimate and allow a detailed cost review. The Escrow Bid Documents shall include all quantity takeoffs, labor, equipment, calculations or rate of productions and progress, copies of quotations from subcontractors and suppliers, memoranda, narratives, consultant's reports, add/deduct sheets, and all other information used by the Bidder to arrive at the prices contained in the Bid Proposal. Estimated costs shall be broken down into the Bidder's usual estimate categories such as direct labor, repair labor, material, equipment, construction equipment operation, construction equipment ownership, expendable materials, materials, and subcontract cost as appropriate. Plant and equipment and indirect costs shall be detailed in the Bidder's usual format. The bidder's allocation of plant and equipment, indirect cost, contingencies, markup and other items shall be included.

3. All costs shall be identified. For items and sub-items amounting to less than $1,000, estimated unit costs are acceptable without a detailed cost estimate, provided that labor, equipment, materials construction equipment, expendable materials and subcontracts, as applicable, are included and provided that indirect costs, contingencies, and markup, as applicable, are allocated.

4. Bidding materials provided by the Owner shall not be included in the Escrow Bid Documents unless needed to comply with the requirements of this Specification.

E. SUBMITTAL

1. The Escrow Bid Documents shall be submitted by the low Bidder in a sealed container. The container shall be clearly marked on the outside with the Bidder's name, date of submittal, project name, and the words "Escrow Bid Documents."

2. The Escrow Bid Documents shall be accompanied with an index to inventory the contents of the submittal and the Bid Documents Certification, signed by an individual authorized by the Bidder to execute the Bid Proposal. The following Bid Documentation Certification form shall be used:

BID DOCUMENTATION CERTIFICATION

The undersigned hereby certifies that the Escrow Bid Documents contained herein constitute all the documentary information used in preparation of the bid and that I have personally examined the contents of the Escrow Bid Documents container and have found that the documents in the container are complete and organized as shown by the index.

BY:_____

TITLE:_____

FIRM:_____

DATE:_____

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3. Prior to award, only the index to Escrow Bid Documents of the apparent successful Bidder will be examined, by representatives of the Owner. This examination is to ensure that the index is detailed and complete, and conforms to the format and contents requirements set forth herein.

4. If all the required documentation has not been indexed in the original submittal, a revised index shall be submitted at the Owner's discretion, prior to award of the Contract.

5. If the Contract is not awarded to the apparent successful Bidder, the Bidder next to be considered for award shall, upon request of the Owner, submit Escrow Bid Documents for processing.

6. Timely submission of complete Escrow Bid Documents is an essential element of the Bidder's responsibility. Failure to provide the necessary Escrow Bid Documents may be sufficient cause of the Owner to reject the bid.

7. Escrow Bid Documents submitted by unsuccessful bidders will be returned unopened, following award of the Contract.

F. STORAGE

The Escrow Bid Documents will be placed in escrow, for the life of the Contract, in an institution acceptable to both the Owner and the Contractor. The cost of storage will be paid by the Owner.

G EXAMINATION AFTER AWARD OF CONTRACT

1. The Escrow Bid Documents shall be examined by the Owner, the Construction Manager, and the Contractor, at any time deemed necessary by either the Owner or the Contractor, to assist in the negotiation for the settlement of claims.

2. Examination of the Escrow Bid Documents is subject to the following conditions:

   a. As trade secrets, the Escrow Bid Documents are proprietary and confidential.

   b. The Owner and the Contractor shall each designate, in writing to the other party and a minimum of five days prior to examination, representatives who are authorized to examine the Escrow Bid Documents. No other person shall have access to the Escrow Bid Documents.

   c. Access to the Escrow Bid Documents will take place only in the presence of duly designated representatives of both the Owner and the Contractor.

H. FINAL DISPOSITION

1. The Escrow Bid Documents will be returned to the Contractor at such time as the contract has been completed and final settlement has been achieved.

End Section 00 73 00

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work by Owner.
4. Work under separate contracts.
5. Owner-furnished, Contractor-installed products.
6. Owner-furnished, Owner-installed products.
7. Access to site.
8. Coordination with occupants.
9. Work restrictions.
10. Specification and drawing conventions.
11. Miscellaneous provisions
12. Sequence of Construction Constraints

B. Related Requirements: Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Mono County Jail

B. Owner: County of Mono Department of Public Works
PO Box 457
Bridgeport, CA 93517

C. Architect: Lionakis
2025 Nineteenth Street
Sacramento, CA 95818
Project Manager: Maynard Feist
Project Architect: Mike Davey

D. Construction Manager: Kitchell CEM
2750 Gateway Oaks, Suite 300
Sacramento, CA 95833
Project Manager: Jim Anderson

1. Construction Manager has been engaged for this Project to serve as an advisor to Owner and to provide assistance in administering the Contract for Construction between Owner

and Contractor, according to a separate contract between Owner and Construction Manager.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. This project will construct a new stand-alone jail facility on county-owned land in Bridgeport, CA. The new jail will replace the existing jail located in downtown Bridgeport and will include housing, intake/release, and support space. Housing will consist of approximately 50 beds in multiple housing units, each with a dayroom. There will also be an outdoor recreation space. The housing area will be controlled by an adjacent central control station. Housing support will consist of program space, medical and mental health, kitchen, and laundry facilities. Staff and public support spaces include an intake area that includes in-custody holding, in-person visitation, family visitation, an isolation room, safety cell, interview space, a public lobby, video visitation, administration, a vehicle sallyport, parking space, mechanical space, electrical space, and storage. The project will also include, but is not limited to, utilities; electrical; plumbing; mechanical; heating, ventilation, and air conditioning; communications; fencing; security and fire protection systems; as well as minor landscaping and pavement for building access.

B. Upon completion the building will consist of a single-story masonry structure that will include two 10 bed dormitory rooms, two 11 bed high security dayrooms, one 4 bed dormitory room, Ad-Seg and Isolation rooms. The building will have a vehicle sallyport connected to Inmate processing, Administration areas and industrial kitchen. The building will be approximately 21,758 square feet and located adjacent to the existing County occupied buildings on County-owned land east of Twins Lake Road in Bridgeport, CA. This project site is located at 221 Twin Lakes Road, Bridgeport, CA 93517.

C. Project includes all work shown on the Contract specifications and drawings, work includes, but is not limited to:, temporary facilities, site preparation, demolition, on-site utilities, concrete, steel, masonry, metals, casework, thermal moisture protection, doors and windows, hardware, finishes, equipment, specialties, Mechanical, Plumbing, Electrical, fire suppression, fire alarm, CCTV surveillance, telecommunications and direct digital control system.

D. This is a Type II facility as described in the California Administrative Code, Chapter 13.

1. The Mono County Jail building is a masonry structure with 8” and 12” insulated block.
2. The housing areas will contain housing cells that are composed of reinforced masonry

E. Type of Contract: Project will be constructed under a single prime contract.

1.5 WORK BY OWNER/ADJACENT USE BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by the Owner. Coordinate the Work of this Contract with work performed by Owner.

B. Adjacent buildings to the project will be in use by the Owner and the public during the project. Minor work may occur on those adjacent sites during the project.

1.6 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.

B. Owner-Furnished, Owner-Installed Products:

1. Live scan
2. ATM machine in lobby
3. Laundry Carts
4. French fry cutter
5. Tray delivery cart
6. Pay phones in Dayrooms
7. Mobile computer cart
8. Large Televisions, Medium Television
9. Sharps receptacle
10. Mayo Instrument Stands
11. Biohazard Waste Receptacles
12. Exam Stools, Exam Chairs, Exam Tables
13. Appliances: Refrigerators-Large, Under-Counter Refrigerator
14. Waste and Recycle Receptacles, trash container
15. Diagnostic set
16. Portable exam light

1.7 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to the area where work on the building addition will be proceeding. Do not disturb portions of Project site beyond areas in which the Work is indicated, or as may be further defined by the Owner.

C. Condition of Existing Buildings: Maintain portions of existing buildings affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.8 COORDINATION WITH OCCUPANTS

A. Owner Occupancy: Owner will occupy site and existing adjacent building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Notice of Completion of the Work, provided such occupancy does not interfere with completion of the Work.

Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1.9 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Architect, Construction Manager and Owner not less than three days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.
3. Contractor's impairment coordinator shall keep permanent records of systems out of service.
4. See Article 1.10.B for additional instructions.

C. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Architect, Construction Manager and Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

D. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.

E. Controlled Substances: Use of tobacco products and other controlled substances within the existing building is not permitted.

F. Workforce Tracking: Contractor shall be required to track all jobsite personnel and provide a list on an as needed basis to the Owner. Information shall include Name, Company and Drivers License number.

G. Contractor shall provide a alcohol and drug free project site.

Contractor shall provide designated smoking areas at least 20 feet from openings to existing buildings.

H. Do not unreasonably encumber site with materials and equipment. Contractor must schedule delivery of materials, furniture, equipment etc. so that installation of each can occur within (1) week of delivery.

I. All materials delivered to the site shall be received by the Contractor and inspected by the Contractor. It is not the responsibility of the County, or its representatives, to receive or accept materials for the Contractor. The Contractor shall notify his vendors and subcontractors of the site location. Mono County and its representatives shall not be held responsible for any damage to materials otherwise delivered.

J. Mono County will designate spaces and routes for the storage of materials and the ingress and egress of workers and equipment to the project site. Materials and equipment shall be kept strictly within these limits. During construction, entrances and access to adjacent facilities shall at all times be kept clean and clear of materials, equipment, refuse, etc.

K. Assume full responsibility for protection and safekeeping of products stored on premises.

L. Move any stored products or equipment which interferes with operations of the existing facility or other Contractors in a timely manner.

M. Obtain and pay for use of additional storage, work areas or parking needed for operations and employees.

N. Provide a secure temporary chain link fence with a top and bottom rail, 6’ high, without barbed wire around open trenches to prevent public access.

O. Excess excavated earth shall be removed from the site.

1.10 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

1.11 MISCELLANEOUS PROVISIONS

A. Construction operations for this project will be located within and adjacent to a existing operating facilities. The Contractor must use the utmost care in notifying the Construction Manager of operations that could affect the ongoing operations of the facility.

1. The Contractor must comply with all rules and regulations set forth by the Mono County which is published as part of bid documents.
2. The Contractor must produce a schedule with the least impact to the daily operation of the existing facilities for Owner’s review and written acceptance.

B. In consideration of the full-time occupancy of the existing facilities, disturbances to existing utility services shall be kept to a minimum.

1. Fire water may be shut off for no more than eight hours per occurrence. Notify Mono County Fire Department and State Fire Marshal representative of shutoff no less than 24 hours in advance. While fire line is inoperative, post a fire watch.
2. If the fire loop is to be interrupted and capped during the course of construction, GC shall perform water pressure test after capping the loop. Provide documentation to Owner and Mono County Fire Department and State Fire Marshal representative showing that 2,250 GPM minimum is available to the existing building.
3. Gas service may be shut off for no more than four hours per occurrence, and may only be shut off between the hours of 11:30 PM and 3:30 AM.
4. Provide no less than 24 hours' notice to Mono County Fire Department and State Fire Marshal representative before demolition of portion of existing fire road. Fire road is to be completed and returned to service per State Fire Marshal requirements prior to commencing building construction. The fire road shall not be used for parking or storage.
5. Fire alarm system may be shut off for no more than eight hours per occurrence. Notify Mono County Department and State Fire Marshal representative of shutoff no less than 24 hours in advance. While fire alarm is inoperative, post a fire watch.
6. During all interruptions in service, all fire hydrants, FDC's, PIV's, and other components of fire water and fire alarm systems shall be tagged and/or bagged as out of service.

C. Site Security: The Contractor shall have sole responsibility for jobsite security.

1. During Work Hours: Protect the work from theft, vandalism, and unauthorized entry.
2. During Off-work Hours: During all hours that Work is not being prosecuted, furnish such watchman's services as Contractor may consider necessary to safeguard materials and equipment in storage on the Project site, including Work in place and in process of fabrication, against theft, acts of malicious mischief, vandalism, and other losses or damages. Contractor is directly responsible for the protection and security of the site and all material, equipment and in-place construction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 25 00 - SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling requests for substitutions.

B. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section 01 33 23 "Submittal Procedures."

C. Procedural requirements governing the Contractor’s selection of products and product options are included under the General Conditions.

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents are considered requests for "substitutions." The following are not considered substitutions:

1. Revisions to Contract Documents requested by the Owner or Architect.
2. Specified options of products and construction methods included in Contract Documents.
3. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS

A. Substitution Request Submittal: Requests for substitution will be considered if received by C.O.B. May 15, 2025. Requests received by the Construction Manager after this date will only be considered at the discretion of the Public Works Director.

B. Submit three copies of each request for consideration. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing

1. Product Data, including Drawings and descriptions of products, fabrication and installation procedures.
2. Samples where applicable or requested.
3. A detailed, side-by-side comparison of the significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include but is not

necessarily limited to elements such as size, weight, durability, performance and visual effect.

4. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors will become necessary to accommodate the proposed substitution.
5. Indicate the effect of the proposed substitution on overall Contract Time.
6. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated
7. The contractor warrants that he/she has investigated the proposed product and determined that it is equal to or superior in all respects to that indicated or specified.
8. The Contractor shall provide a signed statement that the proposed product is in full compliance with the Contract Documents, and applicable regulatory requirements, requires no changes to specified controls and monitoring systems that may be specified in other Sections.
9. The Contractor shall provide information on availability of maintenance service, and source of replacement materials, and provide a sample of Manufacturer's standard form of guarantee or warranty for proposed product.

1.5 CONSTRUCTION MANAGER'S ACTION

A. Within one (1) week of receipt of the request for substitution, the Construction Manager (CM) will request additional information or documentation necessary for evaluation of the request. Within ten (10) days of receipt of the request, or one (1) week of receipt of the additional information or documentation, whichever is later, the CM will notify the Contractor of acceptance or rejection of the proposed substitution. The Architect at his/her sole discretion will determine the acceptability of proposed products and his/her determination shall be final. If a decision on use of a proposed substitution cannot be made or obtained within the time allocated, use the product specified by name in the Contract Documents.

B. No consideration will be given to a substitute product unless, in the Architect's judgment, it complies with the following conditions.

1. Substitution Request is complete.
2. It is equal in quality, performance and serviceability.
3. Its use does not entail changes in details or related construction.
4. It is acceptable in regards to design and aesthetic effect.
5. There is cost, time or both, advantage to the Owner.

C. Acceptance of a product shall not relieve the contractor from responsibility for the proper execution of the Work and any other requirements of the Contract Documents.

D. If a proposed product is not accepted, use the product originally specified or indicated in the Contract Documents.

E. No products other than those indicated or specified in the Contract Documents shall be purchased or incorporated in the Work without the Architect's prior written acceptance.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Conditions: The Contractor's substitution request will be received and considered by the Architect when one or more of the following conditions are satisfied, as determined by the Architect; otherwise requests will be returned without action except to record noncompliance with these requirements.

1. Extensive revisions to Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of the Contract Documents.
3. The request is timely, fully documented and properly submitted.
4. The request is directly related to an "or equal" clause or similar language in the Contract Documents.
5. The Specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
7. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or Separate Contractors, and similar considerations.
8. The specified product or method of construction cannot be provided in a manner which is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
9. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.
10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.

B. The Contractor's submittal and Architect's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents, does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

PART 3 - EXECUTION (not used)

END OF SECTION 01 25 00

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SUBSTITUTION REQUEST FORM

To: Lionakis
2025 Nineteenth Street
Sacramento, CA 95818
P: 916.558.5210 | M: 916.502.3770 | F: 916.558.1919 PROJECT: MONO COUNTY JAIL

We hereby submit for your consideration the following product as substitute for specified item for the above project.

Section	Page	Paragraph	Specified Item

Proposed Substitution: _____

Attach complete product description, drawings, photographs, performance and test data, warranty, information and other information necessary for evaluation. Identify specific model numbers, finishes, options, etc.

A. Will changes be required to building design or drawing dimensions in order to properly install proposed substitution? Yes_____ No_____ If yes, explain.

B. Will the undersigned pay for changes to the building design, including engineering and drawings costs, caused by requested substitution? Yes _____ No _____

C. Differences between proposed substitution and specified item.

_____

D. What affect does substitution have on other trades?

_____

E. Does manufacturer's warranty of the proposed substitution differ from that specified? Yes __ No __

If yes, explain

_____

_____

_____

_____

Submitted by:

_____

Signature

_____

Firm

_____

Address

Date: _____

Telephone: _____

For Architect's Use Only:

__Accepted __Accepted as Noted

__Not Accepted __ Received Too Late

By: _____

Date: _____

Remarks: _____

_____

_____

_____

END OF SECTION 01 25 00 A

SECTION 01 26 00 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Supplemental General Conditions and other Division 01 General Requirements, apply to this Section.

B. Refer to General Conditions for additional provisions regarding changes in the Work. If any provision in this Section should conflict with any provision in the General Conditions, this Section shall control.

1.2 NO CHANGES WITHOUT CONSENT; PERFORMING WORK ORDERED

A. No extra work shall be performed, and no change shall be made, except pursuant to a written Change Order, Work Authorization, or Field Order from the Owner stating that the extra work or change is authorized, and no claim for any addition to the Contract Price or Time for Completion shall be valid unless ordered. However, nothing in this Section shall excuse the Contractor from diligently proceeding and fully completing the Project.

1.3 PROPOSAL REQUESTS; PROCEDURES

A. A. Proposal Requests Authorized. Subject to legal requirements relating to competitive bidding, the Owner may require changes in, additions to, or deletions from the scope of the Work to be performed or the materials to be furnished pursuant to the Contract Documents.

1. The Owner may, at any time, without notice to the sureties, by written order designated or indicated to be a Change Order, make any change or modification in the Work, or add to the Work within the general scope of the Contract, including, but not limited to changes:

    a. In the Specifications or Drawings;
    b. In the sequence, method or manner of performance of the Work;
    c. In the Owner-furnished facilities, equipment, materials, service, or site.

2. Owner Directed Changes Requiring an Increase in Contract Sum. If the Change in or addition to the Work will result in an increase in the Contract Sum, the Owner shall have the right to require the performance thereof on a Lump Sum basis or a Time and Material basis, all as hereinafter more particularly described. The right of the Owner as aforesaid shall apply with respect to each Change in the Work.

B. Methods of Calculation. Adjustments, if any, to the Contract Price by reason of any such change, addition or deletion, shall be determined by one (1) or more of the following methods, at the Owner's sole discretion. The Contractor shall provide sufficient substantiating data to allow the Owner to evaluate the Contractor's Proposal Request.

1. By a lump sum proposal by the Contractor accepted or amended by formal action by the Owner; and/or;

2. By time and materials charges, limited to the "Actual Cost" to perform the Work, as defined herein, plus overhead and profit as defined in this Section.

C. Overhead/Profit and Allowable Time Limitations on Proposal Requests. If the Owner elects to have the Change in the Work performed on a Lump Sum basis, its election shall be based on a lump sum proposal which shall be submitted by the Contractor to the Construction Manager within ten (10) days of the Contractor's receipt of a request therefore, and the Owner reserves the right to request the Contractor to adjust the price of the proposed change order if the Owner disagrees with the Contractor's quoted price. The Owner's request for a lump sum proposal shall not be deemed an election by the Owner to have the change in the Work performed on a lump sum basis. The Contractor's and the Contractor's subcontractor's (all tiers) proposal shall be itemized and segregated by labor, equipment and materials for the various components of the change in, or addition to, the Work (no aggregate labor total will be acceptable) and shall be accompanied by signed proposals of any subcontractors who will perform any portion of the change in, or addition to, the Work and of any persons who will furnish materials or equipment for incorporation therein. The proposal shall also include the Contractor's estimate of the time required to perform said changes or additional work.

D. Labor Limitations. The portion of the proposal relating to labor, whether by the Contractor's forces or the forces of any of its subcontractors, may include reasonable anticipated costs of job site labor, including foremen, who will be directly involved in the change in the Work, for such time as they will be so involved. The Contractor's cost for Construction Managers, Project Engineers, Superintendents, Home Office personnel, Clerical, and like personnel are considered as contained in overhead.

E. Proposal Request Document Requirements. The Contractor's proposal for additional work shall include by itemized breakdown for work to be done by Contractor's own forces and including subcontractors with lower tier subcontractors' itemized breakdowns:

1. Cost of labor, including: hourly base wages, Social Security taxes, Federal or State unemployment taxes, workers' compensation insurance, and fringe benefits required by collective bargaining agreements effective for the Contractor and subcontractor(s).
2. Cost of materials and equipment or furnishings which will be incorporated into the permanent Work, including manufacturers or supplier's cost, sales taxes, and cost of delivery.
3. Construction equipment costs (not small tools) for time of use required at Contractor's or subcontractor's unit rates or at discounted local published rates, whichever are less.
4. General Conditions, General Requirements, supervision, overhead (excluding small tools) and profit applied to the cost of labor, materials and equipment as defined above for:

    a. Work done by Contractor's own forces, not including bond and insurance premiums, fifteen percent (15%);
    b. Work done by subcontractors, all tiers, including bond and insurance premiums, if any, shall not exceed a cumulative total of fifteen percent (15%);
    c. General Conditions, General Requirements, Supervision, Overhead and Profit for Contractor on Subcontractor's work, five percent (5%);
    d. Under no circumstance will the sum total allowable mark up for General Conditions, General Requirements, supervision, overhead (excluding small tools) and profit, exceed a cumulative total of twenty percent (20%), including markups for all parties involved in a change.

5. Contractor's Performance and Payment Bond premiums, one-and-a-half percent (1.5 %).

F. In the event that the Contractor fails to submit his/her proposal within the designated period, the Owner may order the Contractor to proceed with the Change or Addition to the Work and the Contractor shall so proceed. The Owner shall unilaterally determine the reasonable cost and

time to perform the work in question, which determination shall be final and binding upon the Contractor. In no event shall the Contractor allow an unresolved change in the Work to hamper the progress of the Work.

G. In the event that the parties are unable to agree as to the reasonable cost and time to perform the change in, or addition to, the Work based upon the Contractor's Proposal, and the Owner does not elect to have the Change in the Work performed on a Time and Materials basis, the Owner shall make a unilateral determination of the reasonable cost and time to perform the change in the Work, based on its own estimates, the Contractor's submission, or a combination thereof. A Change Order shall be issued for the amounts of cost and time determined by the Owner and shall become binding upon the Contractor unless the Contractor submits his/her protest in writing to the Owner within thirty (30) days of the issuance of the Change Order. Owner has the right to direct in writing the Contractor to perform the change in the Work, which is the subject of such Change Order. Failure of the parties to reach agreement regarding the cost and time of performing the change in the Work and/or any pending protest, shall not relieve the Contractor from performing the change in the Work promptly and expeditiously.

H. If the Owner elects to have the change in the Work performed on a Time and Materials basis, the same shall be performed, whether by the Contractor's forces or the forces of any of its subcontractor or lower tier subcontractors, at actual cost to entity performing the change in Work, without any charge for administration, clerical expense, supervision, or superintendence of any nature whatsoever, or the cost, use or rental of tools or plant. The cost of a Change Order on a Time and Materials basis shall be evaluated according to the limitations defined in this Section. The Contractor shall submit to the Owner daily Time and Material tickets, to include the identification number assigned to the change in work, the location and description of the change in the Work, the classification of labor employed with names, the materials used, the equipment rented (not small tools) and such other evidence of cost as the Owner may require. The Owner may require authentication of all Time and Material tickets and invoices by persons designated by the Owner for such purpose. The failure of the Contractor to secure any required authentication shall, if the Owner elects to treat it as such, constitute a waiver by the Contractor of any claim for the cost of that portion of the change in the Work covered by a non-authenticated ticket or invoice; provided, however, that the authentication of any such ticket or invoice by the Owner shall not constitute an acknowledgment by the Owner that the items thereof were reasonably required for the change in the Work.

I. No costs for General Conditions, General Requirements, supervision, overhead, and profit will be paid by the Owner on account of a change in the Work, except as specifically provided in this Section, and shall be deemed to include all costs and expenses which the Contractor or any of its subcontractors may incur in the performance of a change in the Work and which are not otherwise specifically recoverable by them as provided herein.

J. "Actual Costs" Defined. The actual cost to perform the Work for purposes of this Section is limited to the applicable labor rates set forth in these Specifications hereof, including Contractor's contributions directly attributable to the work authorized; and the material supplier's invoice amount for all material and equipment actually used to accomplish the work authorized. All other direct and indirect costs, all costs attributable to the time needed to perform the Work ordered by such Change Orders, and all profit associated with such work shall be included in the maximum overhead and profit amounts stated hereinabove.

K. Audit and Verification. With respect to any change in the Work resulting in a change in the Contract Sum, the Contractor shall afford and shall require its subcontractors to afford access to the Owner at all reasonable times to any books, correspondence, instructions, receipts, vouchers, memoranda, and records of any kind relating thereto, all of which shall be maintained by the appropriate parties for a period of at least three (3) years from and after the date the Owner makes payment on account of such change in work. The Contractor authorizes the Owner and shall

require its subcontractors to authorize the Owner to check directly with any suppliers of labor and material with respect to, and to obtain, sworn statements and waivers of lien.

L. Changes Requiring a Decrease in Contract Sum. If the change in the Work will result in a decrease in the Contract Sum, the Owner shall require a quotation by the Contractor of the amount of such decrease for use in preparing a Change Order. The Contractor's quotation shall be forwarded to the Owner within ten (10) days of the Construction Manager's (CM) request and, if acceptable to the CM, shall be incorporated in the Change Order. If not acceptable, the parties shall make every reasonable effort to agree as to the amount of such decrease, which may be based on a Lump Sum, properly itemized basis in accordance with this Section.

1. If the CM and the Contractor are unable to agree on the amount of such decrease, the decrease shall be the total estimated reduction in actual cost of the work, as determined by the CM in his/her reasonable judgment and the Contractor shall be bound to credit this amount to the Owner.

M. Periodic Change Orders. The CM is authorized to cumulate Proposal Requests and to process periodic Change Orders including additions and deletions, and to develop procedures providing the methods for such processing in addition to and consistent with those set forth herein.

1.4 WORK AUTHORIZATIONS; PROCEDURES

A. Work Authorizations Authorized. The Owner or its designee is authorized to issue Work Authorizations instructing the Contractor to proceed with extra work.

B. Maximum Amounts. The Owner may approve a work authorization up to the limit as described in Public Contract Code Section 20142. The Owner may approve a time allocation for such work based upon the recommendation of the CM and Architect.

C. Quotation by Contractor. Other than in extraordinary circumstances, as described below, before a Work Authorization is issued, the Contractor shall submit a quotation setting forth an estimated cost of the Work to be performed with sufficient substantiating data to allow the Owner to evaluate the quotation, and an estimate of the time necessary to perform the Work. If requested by the CM, the Contractor shall provide additional data to support the quotation. The Contractor shall acknowledge the quotation as binding.

D. Request for Time Adjustment. If the Contractor claims that the Work Authorization has delayed the construction completion time, he shall verify the claimed delay by submitting a schedule fragnet and supporting information demonstrating with reference to the approved Project Progress Schedule that the Work Authorization in fact caused a delay in the overall completion date of the Project. Upon such demonstration, the CM shall process a request for a Contract Time extension Change Order pursuant to these Specifications.

E. Accumulation of Work Authorizations. At the CM's sole discretion, the Contractor's claims for Change Orders arising from several Work Authorizations may be cumulated into periodic Change Orders adjusting Contract Price, Time, or both, separately or in one Change Order

1. Such periodic Change Orders shall include deductions for Changes which constitute Deductive Change Orders as defined hereinabove, during the time period being considered in the periodic Change Order.

F. Immediate Work Authorizations. In the event extraordinary circumstances arise which require extra work to be authorized before a quotation is prepared by the Contractor, the Owner or its designee may issue an immediate Work Authorization without such quotation. Such Work

Authorization shall include a maximum authorized sum over which no price adjustment will be authorized. The determination as to whether circumstances as described above exist is discretionary with the Owner. Such Work Authorizations otherwise shall be processed as specified in this Section.

1.5 FIELD ORDERS; PROCEDURES

A. Field Orders Authorized. The Owner may issue Field Orders instructing the Contractor to proceed with work differing from that shown in the Contract Documents, and which changes the Scope of the Work, by adding or deleting Work, by instructing Work to be located differently than shown on the Contract Drawings, or making other minor changes which the Owner determines are in the Owner's best interests.

B. No Price or Time Adjustment Authorized. Field Orders are not authorized to change the Contract Price or Time, or to bind the Owner to the payment of any sum to the Contractor.

C. No Cost Adjustments Required. If the change ordered in the Field Order will neither delete nor add costs to the Project, the Field Order shall so note. If the Contractor contends that extra work is required, Article 1.03 of this Section shall apply.

D. Cost Adjustments Required. If the change ordered in the Field Order will either delete or add costs to the Project, the Field Order shall instruct the Contractor to submit its quotation. Thereafter, either Article 1.02 or Article 1.03 of this Section, as specified by the CM, shall apply.

E. Proceeding Before Decision. If the Contractor proceeds with work noted on a Field Order without notifying the CM of its claims that the Work is extra work, the Contractor shall have waived its right to request an adjustment to the Contract Price and/or Time. Such notification must be made prior to commencing any of the Work noted on the Field Order.

1.6 EXTRA WORK REQUESTS; PROCEDURE

A. If the Contractor claims that any Clarification, Field Order, or other instruction issued by the Owner requires work beyond the Scope of the Agreement for Construction, the following provisions shall apply.

1. Notice to CM. Within ten (10) calendar days, the Contractor shall notify the CM of its request, and submit a quotation for the requested costs, pursuant to Article 1.03 of this Section. The Contractor shall submit additional information requested by the CM to decide the request.
2. Action by CM. The CM shall review the Contractor's submittals and either recommend for approval or deny Contractor's request. If the request is approved, the CM may process either a Change Order or Work Authorization, pursuant to this Section. If the request is denied, the CM shall so advise the Contractor. Thereafter, the Contractor shall proceed with the Work in issue. The CM shall issue his/her decision within twenty-one (21) days of receipt of a complete submittal from the Contractor. The CM shall recommend final action to the Owner and the Owner's decision shall be binding on the Contractor.
3. Time. If the request is approved, the time during which the request was being considered shall be included in the time allocation for the Work Authorization adjusting the request, and Article 1.03 of this Section shall apply thereto; if the request is adjusted by Change Order, any Time extension authorized thereby shall include the Time during which the request was pending. If the request is denied, no Time adjustment shall be authorized.

4. Effect of Proceeding. If the Contractor proceeds with the Work without notifying the CM pursuant to Article 1.06.A.1, or before a decision pursuant to Article 1.06.A.2, any claim for a Contract Price and/or Time adjustment shall be waived.
5. Scheduling. The Contractor is responsible to schedule the Work and submit extra-work requests so the time required for decision, as specified in Article 1.06.A.2, does not delay the Work in general.
6. Contractor Notice of Change. If the Contractor asserts that any event or occurrence has caused a change in, or addition to, the Work which change causes an increase or decrease in the Contractor's cost or the time required for the performance of any part of the Work under the contract, the Contractor shall, within ten (10) days of such event, give the Owner written notice as herein required. Said notice shall include the instructions or circumstances that are the basis of the change and the Contractor's best estimate of the cost and time involved.

    a. If the Contractor intends to assert a claim under this Section, he/she must, within ten (10) days after receipt of a written Change Order under Article 1.02 above or the furnishing of a written notice under Article 1.06 submit to the CM a written statement setting forth the specific nature and cost of such claim, unless this period is extended by the CM. The statement of claim hereunder may be included in the notice under Article 1.06 above. Failure to submit such written notice within the specified time frame shall be deemed a waiver of the claim.

        1) The statement of claim shall include all direct, indirect and impact costs associated with the change, as well as the Contractor's estimate of the schedule impact of the change, if any.

7. If the parties are unable to agree to the reasonable cost and time to perform the Change, or are unable to agree as to whether a change occurred, the Owner shall make a unilateral determination as described in Paragraph 1.03G, and the Contractor shall proceed in accordance therewith.

1.7 CHANGE ORDERS REGARDING TIME FOR COMPLETION

A. Any time extension authorized by the Owner pursuant to Article 2.38 of the General Conditions, herein shall be set forth in a Change Order.

1.8 CHANGE ORDERS DUE TO UNAVAILABLE MATERIALS

A. In the event that the Contractor demonstrates good cause for a delay in the Contract Time due to the unavailability of materials, and provides the necessary documentation substantiating said cause for delay, the Owner, in its sole discretion, may either grant a Contract Time extension, or utilize this Section.

B. In the event that the Work is unable to be completed due to unavailable materials, and if all other aspects of the Work have been completed, the Contractor may request to delete the portion of the Work not yet completed from the Agreement for Construction, thereby allowing a Notice of Completion to be filed on the Project. The Owner shall approve no such Change Order unless the Contractor’s request is accompanied by an offer to perform the Work so deleted for a price not to exceed the value of the Work deleted by such Change Order, such work to be commenced upon delivery of the materials, and diligently prosecuted to completion.

C. In the event the Owner elects to accept the Contractor's offer, work done pursuant thereto shall not be construed as Work done on the Project. The application of this Section is limited as follows:

1. No Change Order shall be issued pursuant to this Section until the Contractor has submitted all documents required for final payment.
2. This Section shall apply only to Work, the completion of which is precluded due to unavailable materials.
3. Utilization of this Section lies solely within the discretion of the Owner, and such discretion hereby is delegated to the CM.

1.9 EFFECT OF CONTRACTOR'S ACCEPTANCE OF CHANGE ORDER

A. By accepting a Change Order, Contractor agrees to the changes, if any, in the Contract Price specified for each item and to the specified Extension of Time allowed, if any, for completion of the entire Work on account of such Change Order, and agrees to furnish all labor and materials and perform all Work necessary to complete all additional Work specified therein for the price adjustment and within the time specified therein. Contractor shall make no additional claim for adjustment to the Contract Price or Contract Time, nor for additional costs or damages, on account of the work referenced in such Change Order. A Change Order duly issued by the Owner and accepted by the Contractor shall constitute a complete accord and satisfaction as to the Work, Contract Price, and Contract Time changed thereby. Contractor shall defend and indemnify the Owner, its officers, employees, agents and consultants, if any Subcontractor asserts any claim against the Owner that contradicts, or is inconsistent with, a duly issued Change Order accepted by Contractor.

1.10 EFFECT ON SURETIES

A. All changes authorized by the Contract Documents may be made without notice to, or consent of, the sureties on the Performance and Payment bonds, and shall not reduce their liability on the bonds.

B. The Owner reserves the right to require additional Performance or Payment bonds to secure a Change Order. In this event, the Change Order shall be increased by the actual cost of the bond premium for the additional bond amounts if any.

1.11 GENERAL PROVISIONS RELATED TO CHANGES

A. The Contractor shall not be entitled to any amount for indirect costs, damages, or expenses of any nature, including, but not limited to, so-called "impact" or "cumulative" costs, labor inefficiency, wage, material or other escalations beyond the prices upon which the proposal is based and to which the parties have agreed pursuant to the provisions of Section 01 26 00, and which the Contractor, its subcontractors or sub-subcontractors or any other person may incur as a result of delay, interferences, suspensions, changes in sequence or the like, for whatever cause, whether reasonable or unreasonable, foreseeable or unforeseeable, or avoidable or unavoidable, arising from the performance of any and all changes in the Work performed pursuant to this Section 01 26 00. It is understood and agreed that the Contractor's sole and exclusive remedy in such event shall be recovery of his/her direct costs as compensable hereunder and an extension of the Contract Time, but solely in accordance with the provisions of the Contract Documents.

B. No claim by the Contractor hereunder shall be allowed if asserted after final payment under this Contract. No claim relating to or flowing from a particular change to the work shall be allowed after execution of the Change Order relating to that change.

C. If any disputes should arise between the parties with respect to an increase or decrease in the Contract Sum or an expansion or contraction in the Contract Time as a result of a change in the Work, the Contractor shall not suspend performance of a change in the Work or the Work itself unless otherwise so ordered by the Owner in writing. The Owner shall, however, pay to the Contractor up to the Owner's reasonable estimated value of the change in the work, regardless of the dispute, if said change in the Work results in an increase in the Contract Amount; and the Owner shall have the right to decrease the Contract Amount up to the Owner's reasonable estimated value of the change in the Work, regardless of the dispute, if said change in the Work results in a decrease in the Contract Sum, and the Contractor shall be bound by the Owner's decision as to amount of payment or credit.

1.12 MINOR CHANGES IN THE WORK

A. The Owner and/or CM shall have authority to order minor changes in the Work not involving an adjustment in the Contract Amount or an extension of the Contract Time, and not inconsistent with the Contract Documents. Such changes shall be effected by written order, and shall be binding on the Owner and the Contractor. The Contractor shall carry out such written orders promptly.

1.13 PART 2- PRODUCTS (not used)

1.14 PART 3 – EXECUTION (not used)

1.15 END OF SECTION 01 26 00

SECTION 01 26 13 – REQUEST FOR INFORMATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions and Supplemental General Conditions and other Division 01 General Requirements, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for Request for Information (RFI), including:

1. Definitions.
2. The Request for Information Procedure.
3. Request for Information Review System.

1.3 DEFINITIONS:

A. General: To prevent misunderstanding between the Owner and the Contractor over project procedures, the following definitions are provided:

1. Contract Document Clarification: An answer from the Construction Manager (CM) and/or Architect, in response to an inquiry from the Contractor, intended to make some requirement(s) of the Contract Documents clearly understood. Contract Documents clarifications may be sketches, drawings, or in narrative form and will NOT change any requirements of the drawings or plans. Responses to Contractor inquiries shall be outlined elsewhere in this Section.
2. Project Communications: Routine written communications between the Owner and the Contractor shall be in letter, field memo or mail. All such communications shall be processed through the CM and shall NOT be identified as Request for Information nor shall they substitute for any other written provisions of these Contract Documents.
3. Requests for Information: A written request from the Contractor, to the Owner, seeking an interpretation or a clarification of some requirement of the contract documents. The Contractor shall clearly and concisely set forth the issue for which he/she seeks clarification or interpretation and why he/she believes a clarification is needed. Responses from the Owner will not change any requirements of the Contract Documents. Responses to Contractor inquiries shall be outlined elsewhere in this section.
4. Submittals: Refer to Section 01 33 23 “Submittal Procedures”.
5. Construction Schedule Submittals: Refer to Section 01 32 26 “Construction Progress Documentation”.

1.4 THE REQUEST FOR INFORMATION PROCEDURE

A. General: The following establishes the process and timing concerning RFI’s and their responses

1. In the event that the General Contractor or Subcontractor, at any tier, determines that some portion of the Contract Documents requires clarification or interpretation by the Architect, the General Contractor shall submit a Request for Information in writing to the CM. The written request shall be clearly titled "REQUEST FOR INFORMATION," in capital letters. Requests for Information may only be submitted by the General Contractor. The Contractor shall clearly and concisely set forth the issue for which clarification or interpretation is sought and why a response is needed from the Owner.
2. The Construction Manager will review all Requests for Information to determine whether they are Requests for Information within the meaning of this term. If the CM determines that the document is not a Request for Information, it will be returned to the Contractor, un-reviewed as to content, for resubmittal in the proper manner.
3. Responses to Requests for Information shall be issued within fourteen (14) calendar days of receipt of the request from the Contractor unless the CM determines that a longer time is necessary to provide an adequate response. The Contractor shall not be entitled to any time extension due to the time it takes the CM to respond to the request provided that the CM's responds within the fourteen (14) working days set forth above.
4. Responses from the CM will not change any requirement of the Contract Documents. In the event the Contractor believes that a response to a Request for Information will cause a change to the requirements of the Contract Documents, the Contractor shall immediately give written notice to the CM and Owner stating that the Contractor considers the response to be a change in scope of work. Failure to give such written notice immediately shall waive the Contractor's right to seek additional time or cost under the Changes article found in the General Conditions.

1.5 THE REQUEST FOR INFORMATION REVIEW SYSTEM

A. General: All documents labeled as RFI will be reviewed by the CM to determine whether or not the document meets the definition of an RFI, as stated previously. If the document submitted is an RFI, the document will be entered into the RFI Log and processed for a response.

B. If the document submitted is not an RFI, it will be returned to the Contractor immediately with a standard letter of transmittal stating the following:

1. "This document is not an RFI and therefore is being returned to you without a response. This document has not been entered into the project's RFI Log. Resubmit document in the proper format as (circle one) Project Communications, Submittals, Substitution, Schedule Submittal or other, for processing."

C. The Contractor shall utilize the PMCS provided in accordance with document 01 31 13 for the administration of the RFI's.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION (not used)

END OF SECTION 01 26 13

SECTION 01 29 00 – PAYMENT PROCEDURES

GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Supplemental General Conditions and other Division 01 General Requirements, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.

1. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Construction Schedule, List of Subcontracts, and Submittal Schedule.

B. The Contractor's Construction Schedule requirements are included in Section 01 32 00, "Construction Progress Documentation"; and Submittal Schedule requirements are included in Section 01 33 23, "Submittal Procedures".

1.3 SCHEDULE OF VALUES

A. Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule. See Section 01 32 00 "Construction Progress Documentation" for additional information.

1. Within thirty (30) calendar days after the Award of Contract, the Contractor shall submit Schedule of Values for review by Construction Manager (CM), allocating a dollar value for each activity on the Construction Schedule.

B. Format and Content: Use the Construction Schedule as a guide to establish the format for the Schedule of Values.

1. Identification: Include the following identification on the Schedule of Values:

a. Project name and location.
b. Name of the Owner.
c. Project number.
d. Contractor's name and address.
e. Date of submittal.

2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:

a. Generic name.
b. Related Specification Section.
c. Name of subcontractor.

d. Name of manufacturer or fabricator.
e. Name of supplier.
f. Change Orders (numbers) that have affected value.
g. Dollar value.
h. Percentage of Contract Sum to the nearest one hundredth percent, adjusted to total one hundred (100) percent.

3. The Schedule of Values shall be a product of the CPM Schedule and provide sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. The following information shall be minimally illustrated in the Schedule of Values and be subject to approval by the CM.

   a. Dollar value for each activity will be cost including labor and materials. The dollar value of the General Conditions as well as Overhead and Profit shall be a single line item. The Contractor must provide a dollar value for close-out activities to include as-builts, O&M documentation, Owner Training, Spare Materials etc.
   b. Make sum of activity costs equal the Contract Amount.
   c. Separate line items for General Conditions and may be required by the Owner.
   d. Incorporate State mandated funding breakdown as required by County into Schedule of Values and Applications for Payment for County tracking. The Contractor will be required to track costs within their Schedule of Values as shown on their Bid Proposal Sheet.

4. Component amounts shall be rounded off to the nearest whole dollar, and the cumulative total thereof shall equal the Contract Amount.
5. All material storage will be the responsibility of the Contractor.
6. The CPM Schedule shall be progressed in accordance with the General Requirements Section “Construction Progress Documentation” 01 32 00 and the schedule update shall be utilized as the basis for the Contractor’s Application for Payment.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as reviewed by the Owner, CM and Architect, and paid for by the Owner. See General Conditions for additional information regarding progress payments and final payment.

   1. The initial Application for Payment, the Application for Payment at time of Completion, and the final Application for Payment involve additional requirements as listed below.

B. Payment Application Times: Each progress payment date is as indicated in the Agreement. The period of construction Work covered by each Application or Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use AIA Document G702 and Continuation Sheets G 703 as the form for Application for Payment.

D. Incorporate State mandated funding breakdown as required by County into the Applications for Payment for County tracking. The Contractor will be required to track costs within their Pay Applications as shown on their Bid Proposal Sheet.

E. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Contractor. Incomplete applications will be returned without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
2. Include amounts of Change Orders issued prior to the last day of the construction period covered by the Application.

F. Transmittal: Submit three (3) executed copies of each Application for Payment to the CM by means ensuring receipt within twenty-four (24) hours; one (1) copy shall be complete, including waivers of lien and similar attachments, when required.

1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Construction Manager.

G. Waivers of Mechanics Lien and Stop Notice: With each Application for Payment, submit waivers of mechanics lien and stop notices from every entity who may lawfully be entitled to file a mechanics lien or stop notice arising out of the Contract, and related to the Work covered by the payment. Include with each application both Conditional and Non-Conditional Lien Releases for the Contractor and Subcontractors.

1. Submit partial waivers on each item for the amount requested on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.

H. Initial Application for Payment: Administrative actions and submittals that must precede the submittal of the first Application for Payment include the following:

1. List of subcontractors, including names, addresses and contact persons.
2. List of principal suppliers and fabricators.
3. Schedule of Values.
4. Contractor's Construction Schedule (preliminary if not final).
5. Submittal Schedule (preliminary if not final).
6. List of Contractor's staff assignments.
7. List of Contractor's principal consultants.
8. Copies of authorizations and licenses from governing authorities for performance of the Work.
9. Initial survey and damage report.

I. Final Payment Application: Administrative actions and submittals which must precede submittal of the final payment Application for Payment include the following:

1. All pertinent permits and similar approvals such as State Fire Marshal / Division of Forestry, Department of Health and Environmental Services, SJVAPCD, and RWQCB sign-off.
2. Warranties (guarantees) and maintenance agreements.
3. Test/adjust/balance records.
4. Maintenance instructions.
5. Start up performance reports.
6. Change over information related to Owner's occupancy, use, operation and maintenance.
7. Final cleaning.
8. Extra materials.
9. Application for reduction of retainage, and consent of surety.
10. Completion of Project closeout requirements.
11. Completion of items specified in order to achieve Completion.
12. Assurance that unsettled claims will be settled.
13. Transmittal of required Project construction records to Owner.

14. Proof that taxes, fees and similar obligations have been paid.
15. Removal of temporary facilities and services.
16. Removal of surplus materials, rubbish and similar elements.
17. Ensure Owner's exclusive access.
18. Post Warranty Bond in the amount of ten (10%) percent of Final Contract Amount.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 31 13 – PROJECT COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:

1. General project coordination procedures.
2. Conservation.
3. Coordination Drawings.
4. Administrative and supervisory personnel.
5. Project meetings.
6. General installation provisions.
7. Cleaning and protection.

1.3 PROGRESS MEETINGS

A. Progress meetings, coordination meetings and pre-installation conferences are included in Section 01 31 19 – Project Meetings.

1.4 CONSTRUCTION SCHEDULE

A. Requirements for the Contractor's construction schedule are included in Section 01 32 00- Construction Progress Documentation.

1.5 CONTRACTOR'S ON-SITE PERSONNEL

A. At minimum, Contractor must provide key, full-time staff, to manage the project. These key staff include: Project Manager, General Superintendent, Project Engineer, QC Manager and Administrative Assistant. No Work may begin on-site until the Contractor submits, and the Owner approves, these key staff.

B. The following key personnel must be on-site at all times when Work is being performed:

1. Contractor's General Superintendent:

a. Responsibilities: Responsible for administration of the Contractor's Work and the coordination of the Work of the Contractor, Subcontractors and suppliers. The General Superintendent must be on site at all times work is being performed. No

Work may proceed on the site without the presence of the Superintendent or his Owner-accepted Alternate. The Superintendent may not be absent from the project site for more than two consecutive weeks and/or 20 total work days in the course of any 12-month period. Any absence beyond these periods may be cause for the Owner to direct the removal as the Project Superintendent. The General Superintendent may also function as the Responsible Person for accident prevention and as the Contractor's Authorized Representative. If the General Superintendent does function in these latter two capacities, the appointment letter, described below, must so state these additional duties.

b. At least fifteen (15) days prior to the start date for the Work identified in the NTP, Contractor must submit for acceptance by the Owner, the individual proposed for the position of General Superintendent. The submittal shall include four (4) copies of a resume and an Appointment letter for the Superintendent. The Appointment letter must be accompanied by a detailed resume for the candidate, documenting their relevant experience and providing at least three current references.

c. Duties will include, but not be limited to:

1) Be on the Work site at all times during performance of Work, with complete authority to take any action necessary to ensure conformance with the requirements of the Contract Documents.
2) Confer with Construction Manager, Contractor's personnel and subcontractors to discuss and resolve matters such as work procedures and construction problems.
3) Plan, organize and direct activities concerned with the construction and maintenance of the project.
4) Immediately stop any work that does not comply with requirements of the Contract Documents, and direct removal and replacement of any defective Work.
5) Supervise, coordinate, direct and lead workers engaged in construction activities.
6) Work with the project scheduler to prepare the preliminary and baseline project schedules in a logical sequence of activities to meet the project milestones.
7) Review and monitor the activities of all trades to assure compliance with safety plans, building codes and regulatory agency requirements.
8) Investigate damages, accidents or delays. Take necessary action to prevent their recurrences and take corrective action as warranted.
9) Take actions to deal with the results of delays, bad weather and emergencies on the site.
10) Coordinate the scheduling of work activities to facilitate testing and inspection by Contractor's Quality Control (QC) Manager, QC Specialists and Testing Labs.
11) Assist, prepare and oversee the preparation of all submittals required by Section 01 50 00 "Temporary Facilities and Controls".
12) Assure that work areas and project site is cleaned and maintained.
13) Attend all key Project Meetings including, but not limited to, Preconstruction Conference, Schedule Orientation Meeting, Progress Meetings, Commissioning Meetings, Demonstration and Training Meetings, and Closeout Conference.

d. Qualifications:

1) A minimum of 15 years experience as a superintendent, construction project manager, or construction manager on similar size and type of construction projects that included the major trades involved with this Project.

2) Quality Control Manager. See the requirements of Section 014000.

C. The following personnel must be on the job site full-time, 40 hours per week:

1. Project Manager:

a. At least fifteen (15) days prior to the start date for the Work identified in the NTP, Contractor must submit for acceptance by the Owner, the individual proposed for the position of Project Manager. The submittal shall include four (4) copies of a resume and an Appointment letter for the PM. The Appointment letter must be accompanied by a detailed resume for the candidate, documenting their relevant experience and providing at least three current references..

b. Duties: The Contractor's Project Manager will be responsible for the Contractor's personnel and will have overall responsibility to manage and administer the Contract. The Contractor's Project Manager will have the authority to legally bind the Contractor.

c. Qualifications:

1) A minimum of 10 year's experience as a Project Manager on similar size and type of construction projects that included the major trades involved with this Project.
2) A Bachelor's Degree from an accredited university in Architecture, Civil, Mechanical or Electrical Engineering, Construction Management, or equivalent experience.

2. Project Engineer:

a. At least fifteen (15) days prior the start date for the Work identified in the NTP, Contactor must submit for acceptance by the Owner, four (4) copies of an Appointment letter for the Project Engineer. The Appointment letter must be accompanied by a detailed resume for the candidate documenting their relevant experience and providing at least three current references.

b. Duties will include, but not be limited to:

1) Be on the Work site at all times during performance of Work.
2) Confer with General Superintendent and subcontractors to discuss and resolve matters such as work procedures and construction problems.
3) Assist and support the General Superintendent in the performance of the Superintendent's duties with complete authority to take necessary action to assure conformance with the contract requirements.
4) Interpret and explain plans and specification requirements to Contractor's personnel and subcontractors.
5) Prepare and or assist in the preparation of monthly reports, meeting minutes, cost and other administrative reports required by the contract documents.
6) Assist and/or requisition supplies and material required to complete construction.
7) Prepare and/or assist in the preparation of change orders, cost estimates, cost reduction proposals.
8) Assist the project scheduler in updating the monthly progress schedule and the preparation of schedule reports.
9) Prepare Requests for Information (RFI), issue to owner, track disposition and distribute to contractor's appropriate personnel.
10) Oversee the preparation of coordination drawings.
11) Maintain As-Built Documents.

12) Attend all key Project Meetings including, but not limited to, Preconstruction Conference, Schedule Orientation Meeting, Progress Meetings, Commissioning Meetings, Demonstration and Training Meetings, and Closeout Conference.

3. Administrative Assistant (full time on site):

a. Duties will include, but not be limited to: Perform administrative duties as needed to support Contractor's Work.

1.6 OTHER PERSONNEL

A. The above listed staff is a minimum requirement. Contractor must provide all other administrative and supervisory personnel as needed or required for timely compliance with all of the requirements of the Contract Documents and proper coordination of the performance of the Work.

B. Contractor must ensure that each Subcontractor provides personnel as reasonably required for management and coordination of the Subcontractor's Work and for coordination of the Subcontractor's Work with the Work of the entire Project.

1.7 COORDINATION:

A. Coordination: Coordinate construction activities included under various sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different sections of the Specifications that are dependent upon each other for proper installation, connection, and operation. Contractor must not delegate Contractor's responsibility for coordination of the Work to any Subcontractor.

B. Each Contractor shall coordinate his/her construction operations with those of other contractors and entities, including those performing work under other contracts, to ensure efficient and orderly installation of each part of the Work. Each Contractor shall coordinate his/her operations with operations included in different sections that depend on each other for proper installation, connection, and operation. Special attention is given to Section 01 11 00 – Summary of Work, regarding Contractor's use of premises and work to be performed under separate contracts.

C. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.

D. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

E. Make adequate provisions to accommodate items scheduled for later installation by Contractor, Owner, or other contractors.

F. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

G. Utilize the Contract Documents and Owner accepted Submittals to check and coordinate the Work so that no interferences or conflicts between trades occur. This checking and coordination

must be performed and completed before construction is commenced in each affected area and may require the preparation and submission of Coordination Drawings.

H. Requirements for coordination drawings are included in Section 01 33 –Submittal Procedures.

1.8 PRE-WORK VERIFICATION

A. Prior to starting a particular type or kind of Work:

1. Review all Contract Documents and other relevant data related to the type or kind of Work to be performed;
2. Check Owner accepted Submittals and verify dimensions at Project Site;
3. Review manufacturer's instructions applicable to conditions under which Work is to be installed;
4. Inspect areas, surfaces or construction receiving the Work.
5. Report to Owner in writing and concerns, issues, or problems observed during Contractor's Pre-Work verification.

B. Start of Work shall signify compliance with the above requirements and acceptance of previously placed construction or substrates as being in satisfactory condition to achieve proper installations and first quality workmanship as intended under these Contract Documents. Failure to so inspect and report to Owner shall constitute an acceptance of the previously placed construction or substrates.

1.9 ADMINISTRATIVE PROCEDURES:

A. Coordinate scheduling and timing of required administrative procedures with other construction activities, including those of other contracts, to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.

B. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water and materials.

C. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work. Refer to other sections for disposition of salvaged materials that are designated as Owner's property.

1.10 SUBMITTALS:

A. Staff Names: Within fifteen (15) days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the Project site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses,

and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

1.11 PROJECT MANAGEMENT CONTROLS SYSTEM

A. Contractor shall provide a Project Management Controls System (PMCS) for purposes of hosting and managing project communication and documentation until Final Completion. The Contractor shall provide a Website interface to connect and communicate with the construction team. The Contractor will cooperate and provide assistance with the use of the PMCS. The contractor will provide at least one PMCS Website training session. The administrative and procedural requirements for documenting the progress of construction during performance of the Work using the PMCS shall include, but not be limited to, the following:

1. Project directory.
2. Project correspondence.
3. Meeting minutes
4. Contract modifications forms and logs.
5. Requests for Interpretation / Information (RFI) forms and logs.
6. Schedule and calendar management.
7. Submittal register, packages, forms and logs.
8. Daily Construction Reports.
9. Payment Applications.
10. Document management.
11. Issues List.
12. Drawings and Specifications document hosting, viewing.
13. Punch List.
14. Inspection Requests, reports.
15. Cost Control.

B. Contractor shall provide each of its employees and subcontractors that need access to the system. Contractor shall also provide service (up to 6 additional licenses or seats) for the Project Owner's Team to use the PMCS.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS:

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer's Instructions: Comply with the manufacturer's installation instructions and recommendations, to the extent that these instructions and recommendations are more explicit or more stringent than requirements contained in Contract Documents.

C. Verify characteristics of interrelated assemblies and equipment for compatibility. Coordinate Work having independent responsibilities for installation connection, or servicing access.

D. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

E. Provide attachment and connection devices and methods necessary for securing work. Secure work true to line and level. Allow for expansion and building movement.

F. Visual Effects: Provide uniform joint width in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Construction Manager for final decision.

G. Recheck measurements and dimensions, before starting each installation.

H. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

I. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

J. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

3.2 CLEANING AND PROTECTION:

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration prior to Final Acceptance.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging or otherwise deleterious exposure during the construction period.

D. Execute periodic cleaning to keep Work, Site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations. Leave the work “broom clean”.

E. Provide onsite containers for collection of waste materials, debris and rubbish.

F. Remove waste materials, debris and rubbish from site periodically and as often as necessary to maintain an orderly construction site, and dispose of at legal disposal areas away from site.

G. Do not allow trash containers to overflow.

H. Clean interior spaces prior to start of finish painting and continue cleaning on as-needed basis until painting is finished.

I. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.

J. Provide provisions for appropriate removal of and stockpiling of snow, drainage/erosion control from snow melt.

K. Monitor temperatures and provide required freeze protection, to include, temporary heating to protect materials (both stored and in-place work) from freeze damage, temperature and humidity control to maintain quality of finishes.

END OF SECTION 01 31 13

SECTION 01 31 19 – PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Supplemental General Conditions and other Division 01 General Requirements, apply to this Section.

1.3 PRECONSTRUCTION CONFERENCES

A. Prior to commencement of work, a pre-construction conference will be held to discuss procedures to be followed during the progress of the Work. The meeting will be scheduled after execution of the agreement and prior to commencement of work.

B. Location: To be determined by Construction Manager.

C. Attending shall be:

1. Inspector of Record
2. Architect and his/her professional consultants, as needed
3. Contractor
4. Contractor's Superintendent
5. Major subcontractors
6. Owner Representatives
7. Others as appropriate

D. Agenda: Following is suggested agenda. Actual agenda will be prepared and distributed by Construction Manager prior to meeting:

1. Introductions.
2. Distribution and discussion of:

    a. List of major subcontractors and suppliers.
    b. Projected Construction Schedules.

3. Critical work sequencing and reiteration of contract obligation toward meeting milestones.
4. Major equipment deliveries and priorities.
5. Project Coordination.
6. Designation of responsible personnel.
7. Procedures and processing of:

    a. Correspondence.

b. Submittals.
c. Field Orders and clarifications.
d. Proposal requests and quotations.
e. Change Orders and Work Authorizations.
f. Applications for Payment.
g. Requests for Information.

8. Procedures for maintaining Record Documents
9. Use of premises:

a. Office, work and storage areas.
b. Owner requirements.

10. Construction facilities.
11. Temporary utilities.
12. Security considerations.
13. Housekeeping and clean-up procedures.
14. Insurance requirements.
15. Wage and hour compliance.
16. Noise and dust control.
17. Testing and Inspection.
18. Survey control.
19. Other Subjects as appropriate.

1.4 PROGRESS MEETINGS

A. The Construction Manager will schedule and hold meetings weekly. Construction Manager will prepare Agenda for such meetings and distribute to the interested parties at the next successive meeting.

B. Location: Contractor's field office or other acceptable location. Time and location of the meeting will be determined during the Pre-construction Conference.

C. Attending shall be:

1. Inspector of Record
2. Contractor
3. Contractor's Superintendent
4. Subcontractors, as appropriate to the Agenda
5. Suppliers, as appropriate to the Agenda
6. Owner, as needed
7. User Department representatives as needed
8. Architect, and his/her professional consultants as needed
9. Others, as appropriate to the Agenda

D. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule.

a. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

2. Review the present and future needs of each entity present, including such items as:

a. Interface requirements
b. Time
c. Sequences
d. Deliveries
e. Off-site fabrication problems
f. Access
g. Site utilization
h. Temporary facilities and services
i. Hours of work
j. Hazards and risks (Contractor's Responsibility)
k. Housekeeping
l. Quality and work standards
m. Change Orders
n. Documentation of information for payment requests
o. RFI's
p. Submittals
q. Correction Notices
r. Disputed items

3. Reporting: No later than each successive meeting, Construction Manager will distribute copies of minutes of the meeting to each party present. Included will be a brief summary, in narrative form, of progress since the previous meeting and report.
4. Schedule Updating: Contractor to revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

1.5 QUALITY ASSURANCE / QUALITY CONTROL MEETINGS

A. The Construction Manager will schedule and hold meetings weekly. Construction Manager will prepare Agenda for such meetings and distribute to the interested parties at the next successive meeting.

B. Location: Contractor's field office or other acceptable location. Time and location of the meeting will be determined during the Pre-construction Conference.

C. Attending shall be:

1. Inspector of Record
2. Contractor
3. Contractor's Superintendent
4. Subcontractors, as appropriate to the Agenda
5. Owner, as needed
6. Architect, and his/her professional consultants as needed
7. Inspector of Record
8. Others, as appropriate to the Agenda

D. Agenda: Review deficiencies in construction work and set deadlines to complete the deficient work. Deficiencies to be reviewed will have been noted by the Inspector of Record, Testing Laboratory, Construction Manager, Contractor and its subcontractors. Progress will be tracked by the Construction Manager and reviewed weekly by all parties.

1. Reporting: No later than each successive meeting, Construction Manager will distribute copies of minutes of the meeting to each party present. Included will be a brief summary, in narrative form, of progress of each deficient item since the previous meeting and report.
2. Deficiency Corrections: In addition to the other requirements of the contractor's contract with the County of Fresno for this Project, contractor will make every effort to have each deficiency expedited in a manner that will not delay the Work. If the contractor fails to complete the deficiencies in a timely manner that results in delays to the Project Schedule, contractor shall fully bear the time and cost impacts of such actions.

1.6 PROGRESS PAYMENT MEETINGS

A. Schedule and hold a billing meeting each month prior to submittal of Application for Payment. Billing meetings shall coincide with last of month progress meeting, whenever possible.

B. Location: Contractor's field office or other acceptable location.

C. Attending shall be:

1. Inspector of Record
2. Construction Manager
3. Architect, as needed
4. Contractor
5. Owner, as needed

D. Prepare an itemized draft of the month's proposed billing for review with the Construction Manager, Architect and Owner at the billing meeting. Refer to Section 01 29 00 – Payment Procedures, for further requirements.

E. Following review of the proposed billing, revise as required, prepare Application for Payment, and submit to the CM. The CM will certify and forward it to the Owner, who will authorize payment upon receipt of partial waivers of lien from the Contractor and all Subcontractors for previous payment.

1.7 PRE-INSTALLATION CONFERENCES

A. Contractor shall convene a pre-installation conference for items of work contained in each division of the specifications, each trade within the division, and each subcontractor within the division.

1. Contractor shall convene a pre-installation conference prior to commencing the Work of the section, trade or subcontractor.
2. Contractor shall require attendance of each subcontractor and each trade directly affecting or affected by the Work within the division.
3. Construction Manager, Inspector of Record, Architect and Owner may attend pre-installation conferences.
4. Contractor shall convene additional conferences when required by individual section of the specification.

5. Contractor shall prepare an agenda, preside over the conference, and record minutes, and distribute copies within two (2) days after the conference to participants, with three (3) copies to the Construction Manager.
6. At a minimum, Contractor shall review conditions of installation, coordination, preparation, approved submittals, contract documents, schedule, testing and inspection, and means and methods planned to be used to perform the work.
7. Within forty-five (45) days after Notice to Proceed, submit a proposed list of pre-installation conferences, the approximate dates of the conferences, and items of work to be covered, for approval by the CM. Provide the CM with the actual date, time, and location of each conference at least one (1) week in advance of each conference.

1.8 GUARANTEE/WARRANTIES, BONDS, AND SERVICE AND MAINTENANCE CONTRACTS REVIEW MEETING

A. Eleven (11) months following date of Notice of Completion, hold a meeting for the purpose of review of guarantees/warranties, bonds, and service and maintenance contracts for materials and equipment. Take action as appropriate to implement repair or replacement of defective items, and to extend service and maintenance contracts.

B. Attending shall be:

1. Construction Manager
2. Architect
3. Owner's and Architect's Consultants, as appropriate
4. Contractor
5. Subcontractors, as appropriate to the Agenda
6. Suppliers, as appropriate to the Agenda
7. Others, as appropriate to the Agenda
8. Owner

PART 2 - PRODUCTS (not used)

EXECUTION (not used)

END OF SECTION 01 31 19

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Special reports.

B. Related Requirements:

1. Section 01 10 00 “Summary” for Sequence of Construction Events

2. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
3. Section 01 40 00 "Quality Requirements" for submitting a schedule of tests and inspections.
4. Section 01 31 00 “Project Management and Coordination” for submitting and distributing meetings and conference minutes.
5. Section 01 32 33 “Photographic Documentation” for submitting construction photos.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file.
3. Two paper copies.

B. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

E. Construction Schedule Updating Reports: Submit with Applications for Payment.

F. Daily Construction Reports: Submit at weekly intervals.

G. Material Location Reports: Submit at monthly intervals.

H. Site Condition Reports: Submit at time of discovery of differing conditions.

I. Special Reports: Submit at time of unusual event.

J. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Construction Manager's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Construction Manager/Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
5. Project Completion: Indicate completion in advance of date established for Project Completion, and allow time for Architect's administrative procedures necessary for certification of Project Completion.
6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
3. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
4. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Work Restrictions: Show the effect of the following items on the schedule.

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Project Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mock-ups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.
    k. Curing.

l. Building flush-out.
m. Startup and placement into final use and operation.

7. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

a. Structural completion.
b. Temporary enclosure and space conditioning.
c. Permanent space enclosure.
d. Completion of mechanical installation.
e. Completion of electrical installation.
f. Project Completion.
g. Insert a list of major areas here if specific scheduling is required. List might include nonbuilding work, such as roads, parking, landscape development, and similar work.

D.

1. Start date in Master Schedule are for planning purposes. Contractor shall utilize the Notice to Proceed date as the start date and use the durations within the Master Schedule. Any changes to the durations must be approved by the Owner prior to the Contractor's Construction Schedule being accepted.
2. Contractor must ensure that the durations for start-up, TAB, commissioning, punchlist and correction, final cleaning and turnover are accurately accounted for in the Contractor's Construction Schedule and not rely solely on the Master Schedule.
3. Contractor shall include a weather allowance for normal inclement weather days in the schedule of twenty (20) working days for work days where the amount of rain is more than 0.20 of an inch or the amount of snow is greater than 6 inches in a single day. The weather allowance shall be included as part of the total contract duration. Weather days can only be used when the activity affected by the inclement weather is on the critical path. No time extension will be allowed for normal inclement weather. Extension of time due to weather delays is considered non-compensable. Average precipitation totals for Bridgeport shall be as reflected in the Western Regional Climate Center website.
4. Contractor shall also consider the effect of temperature on critical path activities and schedule accordingly.

E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

1. See Section 01 29 00 "Payment Procedures" for cost reporting and payment procedures.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

G. Recovery Schedule: When a periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to

working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

H. Computer Scheduling Software: Prepare schedules using the latest Primavera P6 scheduling software, release 8.3 or latest version release.

2.2 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 30 days of date established for commencement of the Work. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.
2. Construction schedule shall have no more than 20% of activities that are critical.

C. Other methods of construction scheduling may be used by the Contractor. Submit alternate methods for schedule tracking to the Construction Manager for approval prior to implementation.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.

13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Notice of Project Completions authorized.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SHORT INTERVAL SCHEDULE

A. Short interval scheduling (SIS) shall be used throughout onsite construction activities.

B. Develop and provide a SIS directly from the Contractor’s Construction Schedule. SIS shall contain sufficient detail to evaluate daily milestones and manpower/equipment loading and shall cross reference and identify/tie into monthly updated schedule’s tasks.

C. Interval shall be a 4 week duration, including prior week, week submitted and two weeks thereafter.

D. SIS shall be submitted weekly 24 hours prior to the Weekly Progress Meetings where one of the items of discussion will be the Contractor’s schedule.

E. A separate Weekly Scheduling Meeting may be required beyond the Weekly Progress Meeting to review in more detail the Contractor’s Construction Schedule.

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

2.7 TIME EXTENSIONS

A. When a Proposed Change Order is issued, which has the potential to impact specified completion dates, a CPM Network Fragment shall be prepared by Contractor to reflect impact of such changes. After a Network Window has been accepted and Contractor authorized to proceed with proposed Change Order, it shall be incorporated into the Schedule. No additional cost beyond that provided in the General Conditions will be allowed for incorporation of approved proposed Change Orders into Schedule. In addition to provisions of the General Conditions and Supplementary Conditions, the time for completion of the work will be adjusted in accordance with these procedures:

1. Any request for an adjustment of the Contract Time for completion submitted by Contractor for changes or alleged delays shall be accompanied by a complete Time Impact Analysis, which shall be submitted by Contractor for review within twenty-one (21) calendar days after the request. Time extensions will not be granted unless substantiated by the CPM Schedule, and then not until the CPM project float becomes zero.
2. Each Time Impact Analysis shall provide information justifying the request and stating the extent of the adjustment requested for each specific change or alleged delay. Each Time Impact Analysis shall be in form and content acceptable to the CM, and shall include, but not be limited to, the following:
    a. A fragmentary CPM type network (Fragment) illustrating how Contractor proposed to incorporate the change or alleged delay into the current updated Official Schedule.
    b. Identification of activities in the current updated Contract Progress Schedule, which are proposed to be amended due to the change or alleged delay, together with engineering estimates and other appropriate data justifying the proposal.
3. The Time Impact Analysis shall be determined on the basis of the date or dates when the change or changes were issued, or the date or dates when the alleged delay or delays began. The status of the construction project and Time Impact Analysis shall include event time computations for all affected activities including but not limited to work around sequencing, or recovery options to maintain the original Contract completion date.
4. The CM may require that Time Impact Analyses be provided in order to demonstrate the time impact upon the overall project and the time for completion, at no additional cost to the County.
5. If the County finds after review of the Time Impact Analysis that Contractor is entitled to any extension of time for completion, the time for completion will be adjusted accordingly by the County, and Contractor shall then revise the Official Schedule accordingly.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
    1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications. Contractor will be required to provide backup to support experience of in-house personnel.
    2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting and prior to each monthly payment application.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

C. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.2 PAYMENTS WITHHELD

A. Progress payment may be withheld in whole or in part should Contractor fail to comply with requirements of this section.

END OF SECTION 01 32 00

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SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Preconstruction video recordings.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting photographic documentation.
2. Section 01 78 00 "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
3. Section 02 41 00 "Demolition" for photographic documentation before selective demolition operations commence.

1.3 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within three days of taking photographs.

1. Digital Camera: Minimum sensor resolution of 8 megapixels.
2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
3. Identification: Provide the following information with each image description in file metadata tag:

a. Name of Project.
b. Name of Owner, Construction Manager, and Architect.
c. Name of Contractor.
d. Date photograph was taken.
e. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
f. Unique sequential identifier keyed to accompanying key plan.

C. Video Recordings: Submit video recordings within seven days of recording.

1. Submit video recordings in digital video disc format acceptable to Owner.

2. Identification: With each submittal, provide the following information:

    a. Name of Project.
    b. Name of Owner, Construction Manager, and Architect.
    c. Name of Contractor.
    d. Date video recording was recorded.
    e. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

B. Digital Video Recordings: Provide high-resolution, digital video disc in format acceptable to Architect.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted. Coordinate with Construction Manager and Sheriff Representative to ensure no sensitive areas outside of the limits of construction are photographed.

    1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

    1. Date and Time: Include date and time in file name for each image.
    2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect and Construction Manager.

C. Preconstruction **Video** and Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points. Coordinate with Construction Manager and Sheriff Representative to ensure no sensitive areas outside of the limits of construction are photographed.

    1. Flag construction limits before taking construction photographs.
    2. Take a sufficient number of photographs to show existing conditions adjacent to property before starting the Work.
    3. Take a sufficient number of photographs of the existing building to accurately record physical conditions at start of construction.
    4. Take additional photographs as required to record settlement or cracking of the existing structures, pavements, and improvements.

D. Final Completion Construction Photographs: Take forty-eight (48) digital photographs after date of Project Completion for submission as Project Record Documents. Construction Manager will direct photographer for desired vantage points.

3.2 CONSTRUCTION VIDEO RECORDINGS

A. Preconstruction Video Recording: Before starting construction, record video recording of Project site and surrounding properties from sufficiently different vantage points to completely record the state of the site and existing building in and around the construction area. Coordinate with Construction Manager and Sheriff Representative to ensure no sensitive areas outside of the limits of construction are videotaped.

1. Flag construction limits before recording construction video recordings.
2. Show existing conditions adjacent to Project site before starting the Work.
3. Show existing building on site to accurately record physical conditions at the start of construction.
4. Show protection efforts by Contractor.

B. Periodic Construction Video Recordings: Record video recording monthly with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last video recordings were recorded.

1. Video shall sufficiently show how construction is affecting the existing structure and site, and the efforts of the Contractor to protect existing site and structures.
2. Minimum recording time shall be 15 minutes.

END OF SECTION 01 32 33

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SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
3. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
4. Section 01 78 00 "Project Closeout" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
5. Section 01 31 00 “Project Management and Coordination” for utilizing Prolog Converge web-based software.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled date of fabrication.
    h. Scheduled dates for purchasing.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.

1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.

    a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    b. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement as provided by Architect.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.

3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned through Architect, before being returned to Contractor.
6. The Contractor is herein made aware that deferred approval submittals, including but not limited to submittals requiring design review by the State's consultants and/or controlling agencies, such as the SFM or BSCC, will have minimum 16 weeks review periods. The Contractor shall appropriately include this time in their Project Schedule to avoid delays. Subsequent reviews may be required if initial submittal is not approved. Contractor shall schedule activities and approvals accordingly and no additional Contract Time will be given to Contractor as a result of such submittal and approval.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of subcontractor.
    g. Name of supplier.
    h. Name of manufacturer.
    i. Submittal number or other unique identifier, including revision identifier.

        1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

j. Number and title of appropriate Specification Section.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Other necessary identification.

4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

   a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return without review submittals received from sources other than Contractor.

   a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

      1) Project name.
      2) Date.
      3) Destination (To:).
      4) Source (From:).
      5) Name and address of Architect.
      6) Name of Construction Manager.
      7) Name of Contractor.
      8) Name of firm or entity that prepared submittal.
      9) Names of subcontractor, manufacturer, and supplier.
      10) Category and type of submittal.
      11) Submittal purpose and description.
      12) Specification Section number and title.
      13) Specification paragraph number or drawing designation and generic name for each of multiple items.
      14) Drawing number and detail references, as appropriate.
      15) Indication of full or partial submittal.
      16) Transmittal number, numbered consecutively.
      17) Submittal and transmittal distribution record.
      18) Remarks.
      19) Signature of transmitter.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., MCJ-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., MCJ-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.

4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of firm or entity that prepared submittal.
    g. Names of subcontractor, manufacturer, and supplier.
    h. Category and type of submittal.
    i. Submittal purpose and description.
    j. Specification Section number and title.
    k. Specification paragraph number or drawing designation and generic name for each of multiple items.
    l. Drawing number and detail references, as appropriate.
    m. Location(s) where product is to be installed, as appropriate.
    n. Related physical samples submitted directly.
    o. Indication of full or partial submittal.
    p. Transmittal number, numbered consecutively.
    q. Submittal and transmittal distribution record.
    r. Other necessary identification.
    s. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:

    a. Project name.
    b. Number and title of appropriate Specification Section.
    c. Manufacturer name.
    d. Product name.

F. Options: Identify options requiring selection by Architect.

G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

K. Coordination Drawings
1. The Contractor shall prepare and submit coordination drawings and receive acceptance of same before beginning fabrication of major structural components (steel, shear walls etc).
   a. Coordination Drawings shall show all major components such as steel beams, steel columns, steel frames, mechanical ductwork, sprinkler lines, sanitary sewer lines, roof drain piping, domestic water piping vent piping, large electrical conduit (3" or greater), telephone/data cable trays, and ceiling assemblies. Drawings shall include ¼" scale plans and ½" scale sections of corridors and other highly impacted areas.
   b. Provide Coordination Drawings for the ceiling spaces at congested corridors and other highly impacted areas. Contractor to provide Coordination Drawings specific to "Y" chases within dayrooms.
   c. Provide Coordination Drawings for Mechanical Rooms, Electrical Rooms, Low Voltage Rooms and Telephone Rooms.
   d. Coordination Drawings shall demonstrate that such items will fit in the space available within the structure. The Coordination Drawings should highlight to the Architect areas where there may be insufficient space for the systems.
   e. Coordination Drawings shall be prepared in color with each trade and the various assemblies within each trade delineated in a different color.
   f. The overlay of information on the Coordination Drawings shall be done in accordance with the following sequence: structural; mechanical ductwork; sanitary sewer piping; roof drain piping; sprinkler lines; domestic water lines; vent piping; large electrical conduit (3" and greater); telephone/data cable trays; security electronics; and ceiling assemblies.
   g. Where applicable in calculating required clearances, Coordination Drawings shall indicate fireproofing on structural steel.
2. Keep copies of the coordination drawings at the jobsite.
3. The County Representative and Inspector of Record will verify that coordination drawings have been made. The contractor, County Representative and Architect will meet to review the contractor's coordination drawings.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via Prolog Converge as PDF electronic files.

   a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Contractor will be required to print out two paper copies of all "approved" submittals for use by the Architect and Inspector of Record and deliver copies within three business days to the CM for distribution.
3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams showing factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format.

a. PDF electronic file.
b. Three paper copies of Product Data unless otherwise indicated. Architect will return two copies.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:

a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.
   e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

   a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

   a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.

      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule in the following format:

a. PDF electronic file.
b. Two paper copies of product schedule or list unless otherwise indicated. Architect will return one copy.

F. Coordination Drawing Submittals: Comply with requirements specified in Section 01 31 00 "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00 "Construction Progress Documentation."

H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 29 00 "Payment Procedures."

I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 40 00 "Quality Requirements."

J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 78 00 "Project Closeout"

K. Maintenance Data: Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."

L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 SUBMISSION REQUIREMENTS

A. Submit to the Construction Manager a submittal schedule of all submittals separate from the project schedule. Schedule submittal submissions at least three weeks before reviewed and accepted submittals (taking into consideration the possibility of re-submission) will be needed for the execution of the work.

B. Except as otherwise specified for substitutions in Section 01 25 00, General Conditions of the Contract for Construction, Clause 2.45, and for certain other items in this Section 01 33 00, make submissions no later than the number of days outlined below after the Start Date of the Work.

1. Items needed in initial stages of Work or requiring long lead-time for ordering: 45 calendar days.

2. Deferred Approval submittals, for review and approval by agencies such as State Fire Marshal, BSCC: 60 calendar days.

3. All other items: 90 calendar days.

3.2 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 78 00 "Project Closeout."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.3 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 01 33 00

SECTION 01 33 33 - ELECTRONIC DRAWINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The Architect-Engineer, if requested, will provide the Contractor with one (1) electronic copy of the BIM Models for distribution to subcontractors and suppliers. The electronic copy will be provided in Revit XXX format. Fee for the electronic copy shall be in accordance with Paragraph B. below.

1. The Architect's BIM model will be provided in an "as-is" condition (see attachment of indicated level of model development at the end of this section) and the Contractor may use the model at their discretion, and shall assume all responsibility for its use.
2. The model shall be provided to the Contractor as a convenience and shall not be construed to take precedent over the Construction Documents. The contractor shall be responsible to follow the Construction Documents and not make decisions based on the model provided. If information is not contained within the construction documents then the required additional information shall be obtained from the Architect.
3. The models provided shall include all views and sheets that were created within the Revit software at the conclusion of design. Some drawing sheets may have been created in AutoCAD and therefore may not be included in the Revit model.
4. Models will only be provided for the Architectural, Structural, Mechanical, Electrical and any other major specialty item provided in the drawings such as food service equipment. Civil will not provide any models other than information to create a topo surface or a model of the topo surface.
5. Models provided to LOD 300 are design models and are not construction models. They are not intended to show methods and means of construction. They show specific desired location of elements and general representation of the arrangement of elements. It shall be the sole responsibility of the contractor to arrange the final position of all model elements to conform to all Construction Documents and Specifications as well as coordination of all model elements.

1.3 The Architect-Engineer, if requested, will provide the Contractor with one (1) electronic copy of the Contract Document Drawings for distribution to subcontractors and suppliers. The electronic copy will be provided in AutoCAD XXX format. REFERENCES

A. A copy of the Lionakis Digital Licensing Agreement is included at the end of this Section.

END OF SECTION 01 33 33

AGREEMENT FOR TRANSFER OF DIGITAL MODEL FILES

Name of Project: MONO COUNTY JAIL
Project No: 75-15208-00

This Agreement governs the transfer and use of the enclosed files in digital form (the "DIGITAL MODEL FILES"), by and between Lionakis, Inc. known as the "Architect" and Mono County known as the "Owner" of the above referenced Project, and _____ known as the "General Contractor" listed below for the above referenced Project. All rights not expressly granted herein are reserved to and for Lionakis. Consultants under a fully executed written contract with Lionakis for the above-referenced project are excepted from this transfer agreement.

Whereas Owner of the Project, has requested that Lionakis, make copies of DIGITAL MODEL FILES to make available to the General Contractor exclusively for purposes of maintaining a project Building Information Model for determining clash detection of building systems and components, the quantity of components, calculating the surface area or volumes of materials or assemblies necessary for the completion of the project, optimum construction sequencing, material logistics, and construction equipment placement (the "Reference Uses"); and

Whereas, the DIGITAL MODEL FILES were developed by Lionakis for use in preparation of two-dimensional construction documents for the above-referenced Project'; and
Whereas, The General Contractor of the Project understands and acknowledges that the DIGITAL MODEL FILES were not created or intended for use directly as construction documentation by Owner of the Project or third parties, and after the DIGITAL MODEL FILES are provided they can become digitally modified or corrupted without detection, can be modified without Lionakis's knowledge, may not be readable by Owner of the Project or by third parties due to file format incompatibilities, and the original DIGITAL MODEL FILES may be modified by Lionakis after the DIGITAL MODEL FILES are transferred pursuant to the protocol described in this Agreement, any of which circumstance could cause damage or loss to Owner of the Project; and whereas, General Contractor of the Project understands and acknowledges that these risks are inherent with any use of the DIGITAL MODEL FILES and that use of the DIGITAL MODEL FILES will save the Owner of the Project considerable time and expense in the coordination and management of the Project, which represents good and valuable consideration for the following indemnification and release;

Therefore, in consideration of Lionakis, under this Agreement, to transfer the DIGITAL MODEL FILES to the General Contractor of the Project exclusively for Reference Uses, The General Contractor of the Project understands and acknowledges that the DIGITAL MODEL FILES will continue to be modified and refined during the design process and the transferred DIGITAL MODEL FILES only represent a transitory state in that evolution. Not all documents are developed in BIM (Electrical), nor to a complete LOD of 300. Owner of the Project understands and acknowledges that the DIGITAL MODEL FILES developed by the Lionakis and Consultants have been created for the purposes of developing and communicating the design intent of the project. Therefore, Lionakis make no warrantee, express or implied, that the DIGITAL MODEL FILES contain all architectural elements that may have an impact on the Referenced Uses nor that the DIGITAL MODEL FILES are absolutely coordinated with the two-dimensional construction

documents. In the event of conflicts between the two-dimensional contract documents and the DIGITAL MODEL FILES, the contract documents take precedence.

The DIGITAL MODEL FILES have been prepared in accordance with the standard of care in the industry for similar projects under similar circumstances. While the DIGITAL MODEL FILES can be used to detect potential conflicts between elements, they may not accurately reflect all quantities, surface areas, and volumes, and may not accurately or completely describe all architectural elements that may have an impact on the Referenced Uses in the actual construction of the project.

The General Contractor of Project agrees that unless agreed to in other transfer agreements, the Digital Model Files will NOT be used for permitting, regulatory approval, construction purposes, submittal preparation, for modification or reuse on the Project, use for additions to the Project, use for completion of the Project by others, or use for other projects, hereinafter called ”Drawing Uses”. Where used as the basis for “As-built” information, it is understood that the development of the model for this purpose is solely the General Contractor’s responsibility. The use of the model provided by Lionakis is covered under the acknowledgement below.

Based on the foregoing, THE GENERAL CONTRACTOR OF THE PROJECT AGREES, JOINTLY AND SEVERALLY, TO RELEASE, INDEMNIFY, AND DEFEND LIONAKIS AND CONSULTANTS, THEIR RESPECTIVE OFFICERS, SHAREHOLDERS, AND EMPLOYEES , COLLECTIVELY CALLED “INDEMNITEES, FROM ANY AND ALL CLAIMS, DEMANDS, SUITS, LIABILITIES, LOSSES, DAMAGES, AND COSTS, INCLUDING BUT NOT LIMITED TO ATTORNEYS’ FEES, EXPERT WITNESS FEES, AND COURT COSTS ARISING OUT OF OR IN ANY WAY CONNECTED WITH ANY USE OR DRAWING USES OF THE DIGITAL MODEL FILES PROVIDED BY LIONAKIS AND/OR CONSULTANTS PURSUANT TO THIS AGREEMENT.

THE GENERAL CONTRACTOR OF THE PROJECT ACKNOWLEDGES THAT THE TRANSFER OF DIGITAL MODEL FILES IS A SERVICE AND SHALL NOT CONSTITUTE A SALE OF GOODS; AND, LIONAKIS MAKES NO WARRANTY, EXPRESS OR IMPLIED, OF MERCHANTABILITY OR FITNESS FOR ANY PURPOSE IN CONNECTION WITH THE SERVICE OF PROVIDING ACCESS TO, AND THE TRANSFER OF, THE DIGITAL MODEL FILES, OR THAT THE DIGITAL MODEL FILES WILL BE USABLE OR ACCURATE, WHICH WARRANTIES AND REPRESENTATIONS ARE EXPRESSLY DISCLAIMED.

THE GENERAL CONTRACTOR OF THE PROJECT AS NOTED BELOW AGREES TO THE TERMS AND CONDITIONS OF ACCESS TO AND USE OF, THE DIGITAL MODEL FILES UNDER THIS AGREEMENT.

GENERAL CONTRACTOR: _____

Address: _____

_____

Authorized Representative: _____

Signature: _____ DATE: _____

Notary Public: _____ DATE: _____

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SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Commissioning Agent, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified in this Section.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.

C. Mockups: Full-size physical assemblies that are constructed on-site or at manufacturer’s plant. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.

2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control and Quality Assurance Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control and Quality Assurance Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of **five** previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.

1. Indicate manufacturer and model number of individual components.
2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, as in deferred submittals, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Control" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 20 days of Notice to Proceed, and not less than three days prior to preconstruction conference. Submit in format acceptable to Architect and Construction Manager. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager shall not have other Project responsibilities.

2. Qualifications include:

    a. Degree in architecture, engineering, or construction management is required with 10 years of similar experience in the construction industry OR
    b. 20 years of similar experience in construction industry as project superintendent OR
    c. 10 years of similar experience as Quality Control Manager.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Agent.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.9 QUALITY QUALIFICATIONS

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections may specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities (see Section 1.9G below)..

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Agent, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Construction Manager. Mock ups shall appear on the master schedule and all schedule updates .
2. Notify Construction Manager seven (7) days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship. Any appearance issues to be represented as “inherent” shall be represented on the mock up, e.g., “termpering distortions in ballistic glazing”, or paint finish difference between taped joints and sanded gypsum board surfaces.

5. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.

    a. Allow seven (7) days for initial review and each re-review of each mockup.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed unless otherwise indicated.

L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings and as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

M. Room Mockups: Construct room mockups incorporating required materials and assemblies, finished according to requirements. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work. Provide room mockups of the following rooms:

1. Typical Inmate Cell to be selected by the Construction Manager.

N. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-assurance services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit to the owner's designated representative copies of all Contractor Testing and Inspection reports pertaining to the work.
7. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Re-inspecting: The Owner shall be reimbursed by the contractor for cost of any necessary re-inspection or retesting.

F. Testing Agency Responsibilities: Cooperate with**,** Commissioning Authority**,** Construction Manager**,** and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Construction Manager and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections. Including ladders, lifts etc. for inspection of work by testing inspectors.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Construction Manager testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in the drawings and specifications, and as follows:

B. Special Tests and Inspections: Conducted by a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Construction Manager and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority**,** through Construction Manager**,** with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and re-inspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, regulations, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Construction Agreement unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
8. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
9. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
10. AF&PA - American Forest & Paper Association; www.afandpa.org.
11. AGA - American Gas Association; www.aga.org.
12. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
13. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
14. AI - Asphalt Institute; www.asphaltinstitute.org.
15. AIA - American Institute of Architects (The); www.aia.org.
16. AISC - American Institute of Steel Construction; www.aisc.org.
17. AISI - American Iron and Steel Institute; www.steel.org.
18. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
19. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
20. ANSI - American National Standards Institute; www.ansi.org.
21. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
22. APA - APA - The Engineered Wood Association; www.apawood.org.
23. APA - Architectural Precast Association; www.archprecast.org.
24. API - American Petroleum Institute; www.api.org.
25. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
26. ARI - American Refrigeration Institute; (See AHRI).
27. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
28. ASCE - American Society of Civil Engineers; www.asce.org.
29. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
30. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
31. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
32. ASSE - American Society of Safety Engineers (The); www.asse.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
35. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
36. AWEA - American Wind Energy Association; www.awea.org.

37. AWI - Architectural Woodwork Institute; www.awinet.org.
38. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
39. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
40. AWS - American Welding Society; www.aws.org.
41. AWWA - American Water Works Association; www.awwa.org.
42. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
43. BIA - Brick Industry Association (The); www.gobrick.com.
44. BICSI - BICSI, Inc.; www.bicsi.org.
45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
46. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
47. BOCA - BOCA; (Building Officials and Code Administrators International Inc.); (See ICC).
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
49.
50. CDA - Copper Development Association; www.copper.org.
51. CEA - Canadian Electricity Association; www.electricity.ca.
52. CEA - Consumer Electronics Association; www.ce.org.
53. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CGA - Compressed Gas Association; www.cganet.com.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
57. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
58. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CPA - Composite Panel Association; www.pbmdf.com.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRRC - Cool Roof Rating Council; www.coolroofs.org.
63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
64. CSA - Canadian Standards Association; www.csa.ca.
65. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
66. CSI - Construction Specifications Institute (The); www.csinet.org.
67. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
69. CWC - Composite Wood Council; (See CPA).
70. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
71. DHI - Door and Hardware Institute; www.dhi.org.
72. ECA - Electronic Components Association; www.ec-central.org.
73. ECAMA - Electronic Components Assemblies & Materials Association; (See ECA).
74. EIA - Electronic Industries Alliance; (See TIA).
75. EIMA - EIFS Industry Members Association; www.eima.com.
76. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
77. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
78. ESTA - Entertainment Services and Technology Association; (See PLASA).
79. EVO - Efficiency Valuation Organization; www.evo-world.org.
80. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
81. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
82. FM Approvals - FM Approvals LLC; www.fmglobal.com.
83. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
84. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.

85. FSA - Fluid Sealing Association; www.fluidsealing.com.
86. FSC - Forest Stewardship Council U.S.; www.fscus.org.
87. GA - Gypsum Association; www.gypsum.org.
88. GANA - Glass Association of North America; www.glasswebsite.com.
89. GS - Green Seal; www.greenseal.org.
90. HI - Hydraulic Institute; www.pumps.org.
91. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
92. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
93. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
94. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
95. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
96. IAS - International Approval Services; (See CSA).
97. ICBO - International Conference of Building Officials; (See ICC).
98. ICC - International Code Council; www.iccsafe.org.
99. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
100. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
101. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
102. IEC - International Electrotechnical Commission; www.iec.ch.
103. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
104. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
105. IESNA - Illuminating Engineering Society of North America; (See IES).
106. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
107. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
108. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
109. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
110. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
111. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
112. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
113. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
114. ISO - International Organization for Standardization; www.iso.org.
115. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
116. ITU - International Telecommunication Union; www.itu.int/home.
117. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
118. LMA - Laminating Materials Association; (See CPA).
119. LPI - Lightning Protection Institute; www.lightning.org.
120. MBMA - Metal Building Manufacturers Association; www.mbma.com.
121. MCA - Metal Construction Association; www.metalconstruction.org.
122. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
123. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
124. MHIA - Material Handling Industry of America; www.mhia.org.
125. MIA - Marble Institute of America; www.marble-institute.com.
126. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
127. MPI - Master Painters Institute; www.paintinfo.com.
128. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
129. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
130. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
131. NADCA - National Air Duct Cleaners Association; www.nadca.com.
132. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
133. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.

134. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
135. NCMA - National Concrete Masonry Association; www.ncma.org.
136. NEBB - National Environmental Balancing Bureau; www.nebb.org.
137. NECA - National Electrical Contractors Association; www.necanet.org.
138. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
139. NEMA - National Electrical Manufacturers Association; www.nema.org.
140. NETA - InterNational Electrical Testing Association; www.netaworld.org.
141. NFHS - National Federation of State High School Associations; www.nfhs.org.
142. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
143. NFPA - NFPA International; (See NFPA).
144. NFRC - National Fenestration Rating Council; www.nfrc.org.
145. NHLA - National Hardwood Lumber Association; www.nhla.com.
146. NLGA - National Lumber Grades Authority; www.nlga.org.
147. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
148. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
149. NRCA - National Roofing Contractors Association; www.nrca.net.
150. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
151. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
152. NSPE - National Society of Professional Engineers; www.nspe.org.
153. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
154. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
155. NWFA - National Wood Flooring Association; www.nwfa.org.
156. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
157. PDI - Plumbing & Drainage Institute; www.pdionline.org.
158. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
159. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
160. RFCI - Resilient Floor Covering Institute; www.rfci.com.
161. RIS - Redwood Inspection Service; www.redwoodinspection.com.
162. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.
163. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
164. SDI - Steel Deck Institute; www.sdi.org.
165. SDI - Steel Door Institute; www.steeldoor.org.
166. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
167. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
168. SIA - Security Industry Association; www.siaonline.org.
169. SJI - Steel Joist Institute; www.steeljoist.org.
170. SMA - Screen Manufacturers Association; www.smainfo.org.
171. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
172. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
173. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
174. SPIB - Southern Pine Inspection Bureau; www.spib.org.
175. SPRI - Single Ply Roofing Industry; www.spri.org.
176. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
177. SSINA - Specialty Steel Industry of North America; www.ssina.com.
178. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
179. STI - Steel Tank Institute; www.steeltank.com.
180. SWI - Steel Window Institute; www.steelwindows.com.
181. SWPPP – Storm Water Pollution Prevention Plan
182. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
183. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
184. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); www.tileusa.com.
185. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.

186. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
187. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
188. TMS - The Masonry Society; www.masonrysociety.org.
189. TPI - Truss Plate Institute; www.tpinst.org.
190. TPI - Turfgrass Producers International; www.turfgrasssod.org.
191. TRI - Tile Roofing Institute; www.tileroofing.org.
192. UL - Underwriters Laboratories Inc.; www.ul.com.
193. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
194. USAV - USA Volleyball; www.usavolleyball.org.
195. USGBC - U.S. Green Building Council; www.usgbc.org.
196. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
197. WASTEC - Waste Equipment Technology Association; www.wastec.org.
198. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
199. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
200. WDMA - Window & Door Manufacturers Association; www.wdma.com.
201. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
202. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
203. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
204. WPA - Western Wood Products Association; www.wwpa.org.

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up-to-date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; http://dodssp.daps.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; http://eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; www.trb.org.

15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeia; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBC - California Building Code.
2. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
3. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
4. DSCC - Defense Supply Center Columbus; (See FS).
5. FED-STD - Federal Standard; (See FS).
6. FS - Federal Specification; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
7. MILSPEC - Military Specification and Standards; (See DOD).
8. USAB - United States Access Board; www.access-board.gov.
9. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. BSCC – Board of State and Community Corrections.
2. Retain entries below if referenced in Specifications. List has been checked against information obtained from the Internet; it includes only those agencies referenced in the Section Text in MasterSpec Sections. Insert abbreviations, acronyms, and names, such as state highway departments, used in Specifications or added to the office master.
3. CBHF - State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
4. CCR - California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
5. CDCR – California Department of Corrections and Rehabilitation.
6. CDHS - California Department of Health Services; (See CDPH).
7. CDPH - California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
8. CPUC - California Public Utilities Commission; www.cpuc.ca.gov.
9. DOF – California Department of Finance.
10. SCAQMD - South Coast Air Quality Management District; www.aqmd.gov.
11. San Joaquin Valley Air Pollution Control District, www.valleyair.org
12. CSFM, SFM, or OSFM – California State Fire Marshal's Office.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections: Section 01 10 00 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.

1. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use by metering and payment of monthly use charges. Provide connections and extensions of services as required for construction operations. If power provided by the County does not produce enough electricity for construction purposes, the contractor will be required to provide and pay for power sources on their own.

1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion and Sedimentation Control Plan: The State of California Water Resources Control Board (SWRCB) requires that all projects disturbing one acre or more of land shall file a Notice of Intent (NOI) to the Board and must implement a Storm Water Pollution Prevention Plan (SWPPP) in order to meet the requirements of the Construction General Permit 2009-0009-DWQ. Construction work shall not commence until the SWPPP is completed. It shall be the Contractor's responsibility to insure that the SWPPP implementation and documents are kept up to date and in compliance with State requirements. In addition, Contractor shall comply with any additional regulations under the authority having jurisdiction, including local authorities.

C. SWPPP Permit Notice of Intent will be submitted to the SWRCB in the stormwater multiple application and report tracking system (SMARTS) by the County

D. The preparation of the SWPPP shall be the responsibility of the contractor. SWPPP shall be in conformance to the NOI and the Construction General Permit 2009-0009-DWQ.

E. Installation and maintenance of BMPs, Preparation and Submission of all required Annual Reports, implementation of the CSMP in the SWPPP, are the responsibilities of the general contractor.

F. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage, including delivery, handling, and storage provisions for materials subject to water absorption or water damage, discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged Work.

G. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

H. The Great Basin Unified Air Pollution Control District (GBUAPCD) regulates all dust control and emission standards throughout the Central Valley. Regulation VIII – Fugitive PM10 Prohibitions requires that a Dust Control Plan be completed for a large majority of construction projects. District Rule 9510-Indirect Source Review (ISR) is applicable to many development projects as well. It shall be the Contractor's responsibility to implement all measures listed in the Dust Control Plan and ISR Plan if required for the project. At this time, a Dust Control Plan and ISR Plan are not required under Rule 9510 due to the nature of the Projection. However, in the event that this determination changes and an ISR Plan and Dust Control Plan are required, the following shall apply: Construction work shall not commence until the Dust Control plan is completed and approved by the District. Whether a Dust Control Plan is required for the project or not, the Contractor shall be responsible for meeting the requirements of Rule 8021 by providing written notification to the District at least 48 hours prior to commencing any earthmoving activity for any project which involves a residential development site of 1.0 acres to 10.0 acres in area or a non-residential development site 1.0 acres to 5.0 acres in area. Contractor shall pay for all fees related to the dust control plan permit.

I. Dust-Control and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust-control and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions at each phase of the work.
2. HVAC system isolation schematic drawing.
3. Other dust-control measures.
4. Waste management plan.

1.5 QUALITY ASSURANCE

A. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

B. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its

use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

1.7 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel office activities and to accommodate project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices at minimum as follows:

1. Conference room of sufficient size to accommodate meetings of 16 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.
2. Private office for Architect's use.
3. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
4. TV Monitor mounted to wall, 50," 120 Hz, 1080p, for electronic review of RFI, Submittals, Record Documents, BIM coordination drawings.
5. Projector and projection screen for Project Progress Meetings with the Owner.
6. Private Toilet
7. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
8. Lighting fixtures capable of maintaining average illumination of 35 foot-candles at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

D. Store combustible materials apart from building, in compliance with all applicable codes.

E. County Field Office: It shall be equivalent to a mobile trailer having an area of at least 500 square feet. Each window shall be protected with a minimum one-half inch square security bars spaced at two inch centers. The field office shall have four (2) office rooms plus a toilet room. Provide janitorial type services to keep office clean and orderly throughout duration of the project. Furnish and equip the field office as follows for the duration of the project:

1. Furniture required includes: 4-drawer file cabinet (3), wall mounted sloped plan review surface (3 feet by 7 feet), metal plan racks capable of holding the entire set of construction drawings, 4 shelf bookcases (2), desks with return (2), padded desk chairs (2), conference table large enough for 10 occupants, chairs (12), four (2) 4 foot x 3 foot whiteboards, and (1) 4 foot square tack board.

F. Design, construct, connect, maintain, and operate an at-grade sanitary sewage disposal system for the County Field Office's consisting of all piping, connections, clean outs, and at-grade holding tank(s) as required. Design shall be based on a minimum flow of 200 gallons per day of waste and/or occupancy of 5 people, whichever is the greater.

1. Locate holding tanks under the office trailer as an integral component of the trailer. Components shall not to create a safety hazard, obnoxious odors during use and/or while servicing, be an impediment to surface construction vehicle parking and traffic, and installation of construction Work.\

2. Arrange and pay for weekly removal of waste as required to maintain a sanitary and functionally operating waste system. Disposal of waste material shall be in full accordance with all applicable codes and requirements.
3. Obtain and comply with all permits for operation of the system.
4. ~~Land roll-over phone lines- one outlet for conference table, one outlet for plan table). Speaker phones (2 each) and integral answering machine.~~

    a. High-speed wireless internet connection (100 Mbps minimum) for the duration of the project
    b. ~~InFocus Portable widescreen projector, Infocus Model # IN1102, with ceiling bracket and carrying case.~~
    c. ~~Projection Screen~~.
    d. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall.
    e. Drinking water and dispensing unit. Provide a service for drinking water throughout the project to completion.
    f. Coat rack,.
    g. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
    h. Lighting fixtures capable of maintaining average illumination of 35 foot-candles at desk height.

5. Provide and install at least (3) 5lb dry chemical fire extinguishers within the trailer. Extinguishers shall be UL rated. Contractor required to service the extinguishers in accordance with local fire standards.

1.8 TEMPORARY SIGNS

A. Signs of Contractors and Subcontractors: All construction signage shall be the responsibility of the Contractor. Subject submission by Contractor prior to approval of the Architect-Engineer as to size, design, type, location and local regulations, the Contractor and his Subcontractors may erect temporary signs for purposes of identification and controlling traffic. The Contractor shall furnish, erect and maintain such signs required by safety regulations and necessary to safeguard life and property.

B. Contractor is required to furnish and install one (1) 4 ft. by 8 ft. project sign, design for which to be provided by Architect. Location to be coordinated and approved by Owner. Project sign to be securely installed on posts to avoid being blocked by low vegetation. Project sign to be visible from outside of project gate entry, and to be maintained from groundbreaking thru project completion.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."

C. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

B. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

C. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations. Power to be metered.

D. Install electric power service overhead, unless otherwise indicated.

E. Connect temporary service to Owner's existing power source, as directed by Owner.

F. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line for each contractor field office.

1. Provide additional telephone lines for the following:

    a. Provide a dedicated telephone line for each facsimile machine in each field office.
    b. Provide telephone lines for Owner's use. See Section 2.1 for County Field Office.

2. At each telephone, post a list of important telephone numbers.

    a. Police and fire departments.
    b. Ambulance service.
    c. Contractor's home office.
    d. Provide contractor’s project manager and superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Maintain support facilities until the County schedules Notice of Project Completion inspection. Remove only after Notice of Project Completion.
2. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

    a. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
    b. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31.
    c. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.

3. Traffic Controls:

a. Comply with requirements of authorities having jurisdiction.
b. Protect existing site improvements to remain including curbs, pavement, and utilities.
c. Maintain access for fire-fighting equipment and access to fire hydrants.

4. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.

3.4 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Notice of Project Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Notice of Project Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

E. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.

F. At Notice of Substantial Project Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures and “Cleaning During Construction and Final Cleaning."

END OF SECTION 01 50 00

SECTION 01 61 00 – PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.1.01

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

B. The Contractor's Construction Schedule is included in Section 01 32 26, "Construction Progress Documentation"; and the Schedule of Submittals is included under Section 01 33 23, "Submittal Procedures."

C. Administrative procedures for handling requests for substitutions are included under Section 01 25 00, "Substitution Procedures."

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

a. "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.

2. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
3. "Equipment", is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.4 DESCRIPTION

A. Material and equipment incorporated in the Work shall be:

1. New, unless otherwise specified.
2. In a condition acceptable to the Owner and the Architect.
3. Suitable for the use intended.
4. In conformance with EPA codes and regulations and applicable air quality control district.

B. No material or equipment shall be used for any purpose other than that for which it is designed or specified.

C. No material shall contain asbestos.

D. No materials or products shall contain formaldehyde in excess of the amount recommended by the State of California Department of Health Services (DOHS).

1.5 TRANSPORTATION AND HANDLING

A. Deliver manufactured products in the manufacturer's original, unbroken containers or packaging, with identifying labels intact and legible.

B. Immediately on delivery, inspect shipments to assure compliance with the requirements of the Contract Documents and reviewed submittals, and to verify that products are properly protected and undamaged.

C. Handle products in a manner to avoid soiling and damaging the products and their packaging.

D. Promptly remove damaged and defective products from the site, and replace at no increase in Contract Sum.

1.6 STORAGE

A. Store manufactured products in accordance with the manufacturers' printed instructions, with seals and labels intact and legible.

1. Store products subject to damage by the elements in weathertight enclosures.
2. Maintain temperature and humidity within the ranges specified by the manufacturers.

B. Exterior Storage:

1. Store fabricated products above the ground, on blocking or skids, to prevent soiling and staining.
2. Cover products which are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.
3. Store loose granular material in a well-drained area on solid surfaces to prevent mixing with foreign matter.

C. Arrange storage to facilitate inspection.

D. Periodically inspect stored products to assure that products are maintained under specified conditions and free from damage and deterioration.

E. Protection After Installation:

1. Provide substantial coverings as necessary to protect installed products from damage from traffic and construction operations. Remove coverings when no longer needed.
2. Maintain temperature and humidity conditions for interior equipment and finish products in accordance with the manufacturers' printed instructions.

1.7 PRODUCT OPTIONS

A. For products indicated or specified only by reference standard, select any product meeting such standard.

B. For products indicated or specified by naming several products or manufacturers, select any one (1) of the products or manufacturers named which complies with the specified requirements. Products or manufacturers listed first or as “Basis of Design” are the County’s preferred products or manufacturers.

C. For products indicated as “no known equal” indicate only that there is no alternative product that the Architect/Engineer is aware of. It is not intended to limit potential substitutions.

D. Products not meeting the criteria hereinabove, shall be considered Substitutions, and shall be submitted as specified under Section 01 25 00 "Substitutions ".

E. "Or accepted equal" means a product accepted in writing by the Architect prior to bid opening for use in the Work as being equivalent in essential attributes to the product indicated or specified in the Contract Documents. Reference Section 01 25 00 “Substitutions”.

1.8 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.

B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Each Contractor is responsible for providing products and construction methods compatible with products and construction methods of other Contractors.

D. If a dispute arises between Contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

E. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:

    a. Name of product and manufacturer.
    b. Model and serial number.
    c. Capacity
    d. Speed.
    e. Ratings.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents that are new and undamaged and unused at the time of installation.

1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience.

1. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.

a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning "Substitutions" for selection of a matching product in another product category, or for noncompliance with specified requirements.

2. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern and texture from the product line selected.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Notice of Completion.

END OF SECTION 01 61 00

SECTION 01 71 23 – FIELD ENGINEERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION

A. Layout and install the Work to the lines and grades indicated and specified.

B. Retain and pay expenses of a qualified engineer or land surveyor to establish on the site the required reference points and bench marks, establish building lines and elevations, check structural steel framework for plumbness, and establish on steel frame the required basic grid lines from which Work of other sections shall be laid out.

1.3 QUALIFICATIONS OF ENGINEER OR SURVEYOR

A. The engineer or land surveyor shall be licensed in the State of California and shall be acceptable to the Owner.

1.4 SURVEY REFERENCE POINT

A. Existing basic horizontal and vertical control points for the project are indicated.

B. Locate and protect control points prior to starting site Work, and preserve permanent reference points during construction.

1. Make no changes or relocations without prior authorization from the Construction Manager.
2. Report to the Construction Manager if a reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
3. Require land surveyor to replace control points which become lost or destroyed; base replacements on original survey control.

1.5 PROJECT SURVEY REQUIREMENTS

A. Establish lines and levels; locate and layout:

1. Site Improvements:

a. Stakes for grading, fill and topsoil placement.
b. Utility slopes and invert elevations.

2. Batter boards for structures.
3. Building foundations, column locations.

4. Controlling lines and levels required for mechanical and electrical work.

B. From time to time verify layouts to ensure accuracy.

1.6 RECORDS

A. Maintain a complete, accurate log of control and survey Work as it progresses.

1.7 SUBMITTALS

A. Submit name and address of civil engineer and land surveyor.

B. B. Upon request, submit documentation to verify accuracy of field engineering Work.

C. C. Submit record documents under provisions of Section 01 78 00.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION (not used)

END OF SECTION 01 71 23

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

B. Related Requirements:

1. Section 01 10 00 "Summary" for limits on use of Project site.
2. Section 01 33 00 "Submittal Procedures" for submitting surveys.
3. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
4. Section 02 41 00 "Demolition" for demolition and removal of selected portions of the building.
5. Section 07 84 00 "Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.

B. Cutting and Patching Plan: Submit plan describing procedures at least 7 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

D. Certified Surveys: Submit two copies signed by land surveyor or professional engineer.

E. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

    a. Primary operational systems and equipment.
    b. Detention security and operating systems.
    c. Fire separation assemblies.
    d. Air or smoke barriers.
    e. Fire-suppression systems.
    f. Mechanical systems piping and ducts.
    g. Control systems.
    h. Communication systems.
    i. Fire-detection and -alarm systems.
    j. Conveying systems.
    k. Electrical wiring systems.

l. Operating systems of special construction.
m. Central Plant and associated systems.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

a. Water, moisture, or vapor barriers.
b. Membranes and flashings.
c. Exterior curtain-wall construction.
d. Sprayed fire-resistive material.
e. Equipment supports.
f. Piping, ductwork, vessels, and equipment.
g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor or professional engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Notice of Project Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 10 00 "Summary."

1. Any operations within, effecting, or interfering with the functioning of the existing facilities must be submitted to and approved by the Construction Manager a minimum of 5 days prior to the commencement of such operations.

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Pre-installation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend pre-installation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Project Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Project Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

K. Protect exposed concrete flooring from work to be performed atop the concrete (i.e. masonry, lifts, pipe threading equipment etc.).

3.9 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 91 13 "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 73 00

SECTION 01 74 00 – CLEANING & WASTE MANAGEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes cleaning during construction and final cleaning on completion of the work.

B. At all times maintain areas covered by the Contract and adjacent properties and public access roads free from accumulations of waste, debris, and rubbish caused by construction operations.

C. Conduct cleaning and disposal operations to comply with local ordinances and antipollution laws. Do not burn or bury rubbish or waste materials on project site. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains. Do not dispose of wastes into streams or waterways.

D. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

1.3 CLEANING DURING CONSTRUCTION

A. During execution of work, clean site, adjacent properties, and public access roads and dispose of waste materials, debris, and rubbish to assure that buildings, grounds, and public properties are maintained free from accumulations of waste materials and rubbish.

B. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

C. Provide containers for collection and disposal of waste materials, debris, and rubbish.

D. Cover or wet excavated material leaving and arriving at the site to prevent blowing dust. Clean the public access roads to the site of any material falling from the haul trucks.

1.4 SITE CLEANING PRIOR TO LANDSCAPING

A. Remove concrete, concrete wash, stucco splatter, gunite overspray, and all other wastes and debris prior to final grading and landscaping.

1.5 FINAL CLEANING (Reference Section 01 78 00)

A. At the completion of work and immediately prior to final inspection, clean the entire project site as follows.

B. Clean, sweep, wash, and polish all work and equipment including finishes.

C. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces; polish surfaces.

D. Repair, patch, and touch up marred surfaces to match adjacent surfaces.

E. Broom clean paved surfaces; rake clean landscaped areas.

F. Remove from the site all temporary structures and all materials, equipment, and appurtenances not required as a part of, or appurtenant to, the completed work.

END OF SECTION 01 74 00

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Special requirements for waste management during demolition and construction operations.
   1. Salvaging nonhazardous waste.
   2. Recycling nonhazardous waste.
   3. Disposing of nonhazardous waste.

B. Environmental protection requirements, both on-Site and off-Site, during demolition and construction operations.

1.2 RELATED SECTIONS

A. Section 01 52 00 – Construction Facilities.

B. Section 01 57 23 – Temporary Erosion, Sediment, and Storm Water Pollution Control.

C. Section 01 60 00 – Product Requirements.

D. Division 04 and 09 Sections: For disposition of masonry and stone waste and excess materials.

E. Division 31 Sections: For disposition of waste resulting from Site clearing and removal of above- and below-grade Site improvements.

1.3 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Section 01 42 00 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80. References to Standard Specifications shall mean the May 2006 edition of the Caltrans Standard Specifications.

C. Referenced Standards:
   1. ASTM E2114 – Standard Terminology for Sustainability Relative to the Performance of Buildings.
   2. California Green Building Standards Code (CalGreen), Part 11 of Title 24.

1.4 WASTE REDUCTION GOALS

A. The County has set a waste minimization goal for the Project, within the limits of the construction schedule, contract sum, and available materials, equipment, products, and services.

B. Minimize the amount of construction waste generated. The Project goal is to recycle, salvage, or reuse at least 75 percent, as applicable, of the waste generated that may otherwise be disposed in a solid waste disposal facility (landfill).

C. Divert waste generated by construction, demolition, and land clearing activities from disposal through reuse (salvage) and recycling.

D. Reduce waste generated using effective construction resource management practices in materials estimating, ordering, shipping, storage, installation, and disposal.

E. Manage construction waste using best management practices to prevent contacting, contaminating, and polluting storm water run-off.

1.5 DEFINITIONS

A. Definitions pertaining to sustainable development: As defined in ASTM E2114 and as specified in this Section.

B. CIWMB: California Integrated Waste Management Board.

C. Class III Landfill: A landfill that accepts non-hazardous waste such as household, commercial, and industrial wastes, including construction, remodeling, repair, and demolition operations.

D. Construction Waste: As defined in Title 14, CCR, Section 17225.15. Includes waste building materials, packaging and rubble resulting from construction, remodeling, repair, and demolition operations on pavements, houses, commercial buildings and other structures.

E. Construction and Demolition (C&D) Waste: Solid waste that is a portion of the construction waste stream and are source separated or separated for reuse solid waste and recyclable materials, including commingled and separated materials resulting from construction work that are not hazardous, and contains no more than one percent putrescible waste by volume.

F. Conversion Rate: The rate set forth in the standardized Conversion Rate Table (see table at end of this Section) for use in estimating the volume or weight of materials identified in the Construction Waste Management Plan.

G. Divert: To use material for any purpose other than disposal in a landfill or transformation facility.

H. EA: Enforcement Agency as defined by California Public Resources Code (PRC) Section 40130.

I. Environmental Pollution and Damage: The presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances; or degrade the utility of the environment for aesthetic, cultural, or historical purposes.

J. Hazardous Materials: Any material that is regulated as a hazardous material in accordance with 49 CFR 173, requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200, or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in accordance with 40 CFR 261 and Title 22 CCR, Section 66261.3 et seq. Hazardous materials include pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC).

K. Hazardous Waste: As defined in 40 CFR 261 and Title 22 CCR, Section 66261.3 et seq.

L. Putrescible Waste: Solid waste capable of being decomposed by micro-organisms with sufficient rapidity as to cause nuisance because of odors, vectors (insects, rodents, or any other animal capable of transmitting causative agents of human disease), gasses, or other offensive conditions, and include materials such as, but not limited to food wastes, offal and dead animals.

M. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

N. Recycle: To remove a waste material from the Project Site to another site for remanufacture into a new product for reuse by others.

O. Recycling: The process of sorting, cleaning, treating, and reconstituting materials for the purpose of using the material in the manufacture of a new product. Can be conducted on-Site (as in the grinding of concrete and reuse on-Site).

P. Recycling Facility: An operation that can legally accept materials for the purpose of processing materials into an altered form for the manufacture of a new product. Recycling facilities have their specifications for accepting materials.

Q. Reuse: Making use of a material without altering its form.

R. Salvage: Recovery of materials for on-Site reuse or donation to a third party.

1.6 SUBMITTALS

A. General: Submit in accordance with Section 01 33 00.

B. Special Environmental Requirements Submittals: Submit the following:

1. Construction Waste Management Plan.
2. Letter, signed by Contractor, tabulating the total waste material, quantities diverted and the means by which diverted, and declaring that the credit requirements have been met.
3. Submit Certifications from C&D Recycling Facilities that will receive C&D debris.

C. Pay Application Requirements as described in this Section including but not limited to: Waste Management Log, receipts, invoices, weigh tickets and a summary sheet.

1.7 QUALITY ASSURANCE

A. C&D Recycling Facility Qualifications:

1. Operations legally qualified to accept C&D waste in compliance with CIWMB rules and regulations and the local Enforcement Agency.

B. Regulatory Requirements: Comply with CIWMB and local EA rules and regulations.

C. Monitoring:

1. Maintain log of each load, of each category item diverted from landfill. Log in separately debris sent to a Class III landfill and materials sent to recycling facilities.

a. Include in log: type of load, load volume, recycling/hauling service, date accepted by recycling service or by landfill.

b. County reserves the right to audit the log at any time, retain all weight tickets, and receive copies of receipts and invoices.

c. Units of measure: Use same units as stated in the approved plan good faith estimate of construction waste which would be generated if no remedial methods were implemented.

2. Project Inspector shall monitor removal of C&D debris to verify the required material designated to be recycled are being properly sorted and removed from Site to be delivered to recycling facility. Contractor shall coordinate with Project Inspector to have all loads, recycled and non-recycled, verified prior to off-haul. Project Inspector shall initial all receipts, invoices, manifests and weigh tickets.

3. Additional Pay Application Requirements: Submit the following as a requirement for pay application:

a. Waste Management Log with attached receipts, invoices, weigh tickets and a summary sheet duly initialed by Project Inspector.

b. Certification letter stating that, under the penalty of perjury, all materials removed from the Site during the billing period are included in the waste management log, summary sheet, and attachments.

c. Failure to submit these requirements with pay application will prohibit processing of pay application.

4. Coordination, Meetings, Training: Comply with provisions specified in this Section.

1.8 CONSTRUCTION WASTE MANAGEMENT PLAN

A. Within 14 days after receipt of Notice of Award and prior to any waste removal from the Project Site, Contractor shall develop and submit to County a Construction Waste Management Plan as specified in this Section for review.

B. The Construction Waste Reduction Plan shall, as a minimum, address the following:

1. Statement of Waste Management Goals indicating objective to reuse, salvage, and recycle of at least 75 percent, as applicable, of the waste generated.

2. Provide a good faith estimate of total Project construction waste to be generated if no diversion methods were implemented. Identify name of landfill(s) where Project construction waste would normally be disposed of, tipping fees, and estimated cost of disposing Project construction waste in landfill(s).

3. Calculate quantities using the Conversion Rate Table included in this Section.

4. Types and estimated quantities (where reasonably available) of salvageable materials that are expected to be generated during demolition and construction activities.

5. Methods to be used to salvage or reuse materials on-Site. Methods shall include one or more of the following options: contracting with a deconstruction specialist to salvage all or most materials generated, and reuse of materials on-Site or in new construction.

6. Methods to be used to recycle materials. Methods shall include one or more of the following: requiring Subcontractors to take materials back for recycling at a permitted facility, contracting with a full-service recycling service to recycle all or most materials at a permitted facility, processing and reusing materials on-Site.

7. Identify C&D recycling facilities that will receive C&D debris. Include as attachments each

recycling facility's specifications for accepting materials.

8. Describe construction Site facilities, implements, and procedures for collecting, separating, storing, and hauling, each type of C&D debris. Clearly label recycling containers – post acceptable/unacceptable materials. Identify hauler(s) of each particular debris item, who have agreed to accept and divert designated item from landfill.
9. As a minimum, the following materials shall be reused or recycled:
   a. Land clearing debris.
   b. Asphaltic concrete.
   c. Concrete.
   d. Metals.
   e. Wood.
   f. Plywood, oriented strand board (OSB), medium density fiberboard (MDF), and other wood sheet materials.
   g. Rigid foam.
   h. Window glass.
   i. Gypsum board.
   j. Acoustical ceiling panels.
   k. Carpet and pad.
   l. Paint (through hazardous waste outlets).
   m. Piping: steel, copper, plastic, and cast iron.
   n. Fluorescent lights and ballasts.
   o. Cardboard, paper, plastic film, and packaging.
   p. Job-shack wastes, including office paper, cardboard, glass, plastic, and aluminum beverage cans.
10. Describe methods to prevent storm water run-on from contacting stored construction waste. Methods may include but not limited to berms, secondary containment, and covered dumpster/roll-offs. Where dumpsters are used, include number of dumpsters and frequency of pick-up.

C. Plan Implementation
   1. Waste Management Coordinator: Contractor shall designate an on-Site party (or parties) responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the Project.
   2. Maintain log of each load, of each category item diverted from landfill. Log in separately debris sent to a Class III landfill and materials sent to recycling facilities.
      a. Include in log type of load, load volume, recycling/hauling service, date accepted by recycling service or by landfill.
      b. County reserves the right to audit the log at any time, retain all weight tickets, and receive copies of receipts and invoices.

c. Units of measure: Use same units as stated in the approved plan “good faith” estimate of construction waste which would be generated if no remedial methods were implemented.

3. Materials Handling:
   a. Materials to be recycled shall be protected from contamination, and shall be handled, stored and transported in a manner that meets the requirements set by the designated facilities for acceptance.
4. Separation Facilities:
   a. Designate a specific on-Site area or areas to facilitate separation of materials for potential reuse, salvage, recycling, and return.
   b. Keep waste bin areas neat and clean. Clearly mark bins. Do not commingle non-recyclable waste with materials designated for reuse or recycling.
   c. For separation at an off-Site facility that uses facility average diversion rates, those diversion rates must be regulated by a local or state government authority, and a documenting letter stating such shall be provided.
5. Training and Coordination:
   a. Furnish copies of the Waste Management Plan to all on-Site supervisors, each Subcontractor, and County.
   b. Instruction: Provide on-Site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all entities at the appropriate stages of the Project.
   c. Meetings: Include construction waste management on the agenda of regularly scheduled Job-Site meetings.
6. Transportation:
   a. A description of the means of transportation of the recyclable materials (whether materials will be Site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the Site) and destination of materials. Provide an estimate of how often bins will need to be emptied.
   b. Transport materials in covered trucks to prevent contamination of product or littering or polluting of surrounding areas.

D. Waste Reduction Strategies:
   1. Include in supply agreements with vendors, a waste reduction provision, specifying a preference for reduced, returnable, and/or recyclable packaging.
   2. Use detailed material estimates to reduce risk of unplanned and potentially wasteful cuts.
   3. Store materials properly to avoid moisture damage or other damage to materials as well as outdating. Materials that become wet or damp due to improper storage shall be replaced at Contractor’s expense.

1.9 SPECIAL PROGRAMS

A. Contractor shall be responsible for final implementation of programs involving tax credits or rebates or similar incentives related to recycling, if applicable to the Project. Revenues or other savings obtained for recycled, reused or salvaged materials shall accrue to Contractor.

B. Contractor shall document work methods and recycled, reused or salvaged materials that qualify for tax credits, rebates and other savings.

1.10 SUBSTITUTIONS

A. Should Contractor desire to use procedures, materials, equipment, or products that are not specified but meet the intent of these Specifications and are equal to the products specified in all aspects to reduce materials waste, Contractor shall propose these substitutions under provisions of Section 01 60 00.

1.11 CONVERSION TABLE

A. Use the following conversion table for the necessary conversion of material quantities.

Conversion Rates			
Material	Lbs/cy	Tons/cy	Cy/ton
Wood	300 lbs/cu.yd.	0.15 tons/cu.yd.	6.7 cu yds/ton
Cardboard	100 lbs/cy.yd.	0.05 tons/cu.yd.	20 cu yds/ton
Drywall	500 lbs/cu.yd.	0.25 tons/cu.yd.	4 cu.yds/ton
Concrete/Asphalt	1400 lbs/cu.yd.	0.7 tons/cu.yd.	1.4 cu. yds/ton
Mixed Waste	350 lbs/cu.yd.	0.175 tons/cu.yd.	5.7 cu.yds/ton

Source: Resource Efficient Building (1994), Metro Solid Waste Department, Portland, Oregon

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by County. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

3.2 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project Site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

B. Burning: Do not burn waste materials on County’s property.

C. Disposal: Transport waste materials off County's property and legally dispose of them off-Site.

END OF SECTION

SECTION 01 78 00 – PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:

1. Inspection procedures
2. Project record document submittal
3. Operation and Maintenance Data
4. Instruction of Owner's personnel
5. Service and maintenance contracts
6. Submittal of guarantees/warranties and bonds
7. Final Cleaning
8. Restoration of damaged and remedial work
9. Delivery of extra materials

B. Process individual buildings, site package and landscape package separately for project closeouts.

1.3 FINAL COMPLETION:

A. Preliminary Procedures: Before requesting inspection for certification of Final Completion, complete the following. List exceptions in the request.

1. In the Application for Payment that coincides with, or first follows, the date Final Completion is claimed, show 100 percent (100%) completion for the portion of the Work claimed as complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of charges to the Contract Sum.

    a. If 100 percent (100%) completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.

2. Advise Construction Manager (CM) of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.
5. Complete final clean up requirements, including touch-up painting. Touch up and otherwise repair and restore marred exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, the IOR will either proceed with inspection scheduling or advise the Contractor of unfilled requirements. The IOR will work with the CM to prepare the Notice of Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the Notice will be issued.

1. The IOR will repeat inspection scheduling when requested and assured that the Work has been completed.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE:

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the IOR's and Architect's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the IOR and Architect.
4. Submit record drawings, damage or settlement survey, property survey, and similar final record information.
5. Submit consent of surety to final payment.
6. Submit a final liquidated damages settlement statement.
7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Re-inspection Procedure: The Construction Manager will re-inspect the Work upon receipt of notice that the work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Construction Manager.

1. Upon completion of re-inspection, the Construction Manager will prepare a Notice of Completion, or advice the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final completion.
2. If necessary, the re-inspection procedure will be repeated.

1.5 RECORD DOCUMENT SUBMITTALS:

A. General: Do not use record drawings for construction purposes; protect from deterioration and loss in a secure, fire resistive location; provide access to record documents for the Owner, CM and Architect reference during normal working hours.

B. Record Drawings: Maintain clean undamaged set of prints of Contract Drawings and Shop Drawings. Mark the set in the manner approved in advance by the Construction Manager to show the actual installation where the installation varies from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date. Label each document "PROJECT RECORD" in large, neat,

printed letters. Failure to maintain record drawings shall result in withholding of Contractor's payment. See provisions in Section 2.24 – Payment, located in the General Conditions.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
2. Mark information that is important to the Owner, but was not adequately shown on Contract Drawings or Shop Drawings.

    a. Changes made by Change Order, RFI, and other modifications described in the GENERAL CONDITIONS noting the change or modification source.
    b. Locations of significant Work concealed inside the building whose general locations have been changed from those shown on the Contract Documents
    c. Locations of items, not necessarily concealed, which have been changed, with the Architect's prior written approval, from the location shown on the Contract Documents.
    d. Revisions to routing of piping and conduit.
    e. Revisions to electrical circuitry.
    f. Actual equipment locations.
    g. Ducting Size and routing.

3. Note related Change Order or Work Authorization number where applicable.
4. Organize Record Drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on cover of each set.
5. Keep up to date during entire progress of the Work, and furnish additional drawings as necessary for clarification. Failure to maintain record drawings shall result in withholding of Contractor's payment. See provisions in Section 2.24 – 'Payment', located in the General Conditions.
6. Record deviations from the sizes, locations, and other features of installations shown in the Contract Documents.
7. Establish locations of underground Work by Global Positioning Systems (GPS) and reference invert elevations and rates of fall.
8. Give sufficient information to locate Work concealed in the building.
9. Locate main runs of piping, conduit, ductwork and similar items by dimensions.
10. Locate other items either by dimensions or in relation to spaces within the building.
11. Where feasible, the individual or entity that obtained record data, whether the individual or entity is the installer, subcontractor, or similar entity, is required to prepare the mark-up on Record Drawings.
12. Accurately record information in an understandable drawing technique.
13. Record data as soon as possible after it has been obtained. In the case of concealed installation, record and check the mark-up prior to concealment.

C. As-Built Drawings:

1. At time of acceptance of the Work and prior to final payment, using the record drawings for reference, prepare "As-Built" drawings on permanent, electronic files furnished by the Architect. Furnish reproducible record drawings, made from final Shop Drawings, which have been updated to show actual conditions, for Work specified in the individual Specification sections. Where Shop Drawings are marked, show cross-reference on "As Built" Drawings.

    a. Employ and pay a licensed design professional to prepare the "As-Built" drawings from the record drawings, using typical drafting devices and recording information in ink clouding all changes.
    b. After completing the preparation of record drawings, produce three (3) copies of each Drawing, whether or not changes and additional information were recorded. Organize the copies into manageable sets. Bind each set with durable paper

cover sheets, with appropriate identification, including titles, dates and other information on cover sheets.

c. Organize and bind original marked up set of prints that were maintained during the construction period in the same manner.
d. Sign and date the completed Project “As Builts” and transmit them to the Construction Manager, who will forward them to the Owner after final acceptance of the Work.
e. Comply with the requirements for as-builts noted in Section 01 35 54 “Building Information Modelling”.

D. Large-Scale Coordination Drawings: Where furnished, include the coordination drawings as part of the Project “As-Builts”.

E. As-Built Construction Schedule: Using as a basis the latest, updated Progress Schedule required by Section 01 33 00 "Submittals," prepare and transmit a Record Construction Schedule to indicate the actual dates and durations of the various construction activities.

F. Record Specifications: Maintain one (1) complete copy of the Project Manual, including addenda, and one (1) copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in the actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

1. Mark each Specification SECTION to record:

a. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually incorporated in the Work.
b. Changes made by Change Order and other modifications described in the GENERAL CONDITIONS

G. Operation and Maintenance Manuals: Submit in accordance with Section 01 78 23 – “Operation and Maintenance Data”.

H. Operational Tests:

1. Conduct systematic start-up and operational tests as required to demonstrate that all systems have been completed and are in compliance with all requirements of the Contract Documents, and are fully functioning and operational. Contractor shall coordinate his/her start-up and operational tests with contractors performing work under other bid packages. Reference Contract Section 01 91 13 – “Commissioning” for additional information.
2. Furnish a written record of test results using recording type instruments where applicable

I. Upon completion of the Work, submit Close out Documents to the CM for the Owner's records.

J. Transmit manuals in the quantity which is required to be returned, plus the following, unless otherwise specified, which will be retained by the CM for forwarding to the Owner after acceptance of the work.
1. ELECTRONIC COPIES ONLY

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.1 3.01 CLOSEOUT PROCEDURES

A. Owner's Training Sessions: Arrange for each installer of equipment that requires regular maintenance to provide DVD-recorded Owner's training sessions. Arrange for each installer of equipment that requires regular maintenance, to meet with the Owner's personnel to review contractor furnished DVD-recorded instruction in the proper operation and maintenance of each component of each system. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Spare parts and materials.
4. Tools.
5. Lubricants.
6. Fuels.
7. Identification systems.
8. Control sequences.
9. Hazards.
10. Cleaning.
11. Warranties, bonds.
12. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:

1. Start up.
2. Shut down.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective and energy utilization.

C. Schedule training to conform to personnel availability at the facility and to conclude prior to start up of system. The base duration of training shall be determined by the complexity of the system or equipment and shall be done by qualified instructors from the manufacturer or contractor.

D. As part of the operator's training, one (1) lesson plan shall be devoted to reviewing of DVD, which shall be incorporated into the training program to allow new employees to view the DVD at their own convenience and be able to comprehend the system without the need for an instructor in attendance.

E. Prepare one (1) set of DVD's to assist maintenance personnel in trouble shooting the systems and making routine repairs. All DVD's shall be made at the Project facility to ensure that the video portrayal is representative of the true systems.

F. In addition to written technical descriptions, the training shall lay out prescribed hands on training under the supervision of others who have previously completed the training program. The foregoing techniques are to be developed to produce a program that is self perpetuating

and permits a high level of operator training in the event of high turnover rates among those who are assigned to duties in maintenance.

3.2 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

B. At beginning of each training module, record each chart containing learning objective and lesson outline.

C. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.

D. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.

E. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.

F. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.

G. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:

1. Name of Contractor/Installer.
2. Business address.
3. Business phone number.
4. Point of contact.
5. E-mail address.

H. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

I. Produce segments to present a single significant piece of equipment per segment.

J. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.

K. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

L. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

M. Furnish additional portable lighting as required.

3.3 FINAL CLEANING:

A. General: General cleaning during construction is required by the General Conditions and included Section "Temporary Facilities and Controls".

1. Comply with applicable regulatory requirements during the cleaning and disposal operations. Special cleaning requirements for specific elements of the Work are included in appropriate Sections of Division 3 through 40.
2. Use cleaning materials, which will not create hazards to health or property or cause damage to products or Work. Conduct cleaning and waste disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.
3. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to a condition acceptable to the IOR. Use cleaning materials and methods recommended by the manufacturer of the products to be cleaned.
4. Schedule operations with sufficient time for surfaces to dry thoroughly to prevent dust, and other contaminants resulting from cleaning operations from adhering to wet or newly finished surfaces.
5. Complete the following cleaning operations before requesting inspection for Certificate of Completion.

    a. Remove labels that are not permanent labels.
    b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable as vision obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
    c. Clean exposed exterior and interior hard surfaced finishes to a dust free condition, free of stains, grease, fingerprints, labels, spills, spatters, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Mop clean concrete floors. Vacuum carpeted surfaces.
    d. Wipe surfaces of mechanical and electrical equipment, elevator equipment and similar equipment. Remove excess lubrication, paint, mortar droppings and other foreign substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps, vacuum inside of electrical panels and cabinetwork.
    e. Clean the Site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even textured surface.
    f. Clean permanent filters and replace disposable filters of units operated during construction.
    g. Clean ducts, blowers, and coils if units were operated without filters during construction.
    h. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.
    i. Touch up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored, or show evidence of repair or restoration. Do not paint over “UL” and similar labels including mechanical and electrical nameplates.

6. Pest Control: Engage an experienced exterminator to make a final inspection, and to rid Project of rodents, insects, and other pests.
7. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.
8. Compliances: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous

materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

9. Materials remaining after completion of associated Work shall be disposed of or stored as directed by the CM.

END OF SECTION 01 78 00

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SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Section 01 91 13 "Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect and Commissioning Authority will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
b. Enable inserted reviewer comments on draft submittals.

2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Notice of Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.

1. Correct or revise each manual to comply with comments. Submit copies of each corrected manual within 15 days of receipt of comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.

b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format,

identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared record Drawings in Section 01 78 39 "Project Record Documents."

G. Comply with Section 01 78 00 "Project Closeout" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 78 36 – WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties. Contractor will review guarantee/warranty and bonds to verify compliance with Contract Documents.

1. Refer to Article 2.32 of the General Conditions and the separate Guaranty of workmanship and materials.
2. General closeout requirements are included in Section 01 78 00 "Project Closeout."
3. Specific requirements for warranties of the Work and products and installations that are specified to be warranted are included in the individual Sections of Division - 3 through Division - 40. If no specific information is included in individual sections of the specifications, warranty period shall be as follows: Manufacturer's warranties notwithstanding, warrant the entire Work against defects in materials and workmanship for twelve (12) months from date of Notice of Completion.
4. Certifications and other commitments and agreements for continuing services to the Owner are specified elsewhere in the Contract Documents.
5. The Contractor will not be responsible for defects due to misuse, negligence, willful damage, improper maintenance, or accident caused by others, nor shall he be responsible for defective parts whose replacement is necessitated by failure of the Owner's maintenance forces to properly clean and service them, provided the Contractor has furnished complete maintenance instructions to the Owner.

B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 BOND REQUIREMENTS

A. Each bond specified in this Article (faithful performance bond, payment bond and warranty bond) shall meet the requirements of all applicable statutes, including but not limited to those specified in Public Contract Code section 20129 and Civil Code section 3248.

B. Each bond specified in this Article shall be issued by a surety company designated as an admitted surety insurer in good standing with and authorized to transact business in this state by the California Department of Insurance, and acceptable to the County of Mono. Bidders are cautioned that representations made by surety companies will be verified with the California Department of Insurance. Additionally, the County of Mono, in its discretion, when determining

the sufficiency of a proposed surety company, may require the surety company to provide additional information supported by documentation. The County generally requires such information and documentation whenever the proposed surety company has either a Best's Key Rating Guide of less than B+ or a financial size designation of less than VIII. Provided, however, that the County expressly reserves its right to require all information and documentation to which the County is legally entitled from any proposed surety company.

C. Payment and Performance Bonds. The successful bidder shall furnish a faithful performance bond in the amount of 100 percent of the Contract Amount and a payment bond in the amount of 100 percent of the Contract Amount.

D. Warranty Bond. Prior to Final Payment, Contractor shall post a one (1) year Warranty Bond, issued by the surety company that issued the payment and performance bonds, or if approved by Owner, by another surety company that meets the requirements of this Article and is acceptable to Owner, in the amount of ten percent (10%) of the Final Contract Price.

1.4 DEFINITIONS RE: WARRANTIES:

A. Standard Product Warranties are pre-printed written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.5 WARRANTY REQUIREMENTS:

A. Related Damages and Losses: When correcting warranty Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranty Work.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding; reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Costs: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

E. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.6 SUBMITTALS RE: WARRANTIES:

A. Submit written warranties to the Construction Manager upon request of the Construction Manager, and in any event prior to any request by Contractor for final acceptance of the Work. The commencement date for warranties applicable to the Work shall be the date of acceptance of the Work as specified in the Notice of Completion, unless otherwise noted in the Contract Documents (e.g., as to manufacturer's warranties for equipment).

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Construction Manager within ten (10) days of completion of that designated portion of the Work.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.

B. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Construction Manager for approval prior to final execution.

1. Refer to individual Sections of Division - 3 through Division - 40 for specific content requirements, and particular requirements for submittal of special warranties.
2. Submit the Guarantee/Warranty typed on the Contractor's letterhead if for the entire Work, or on the Subcontractor's letterhead if for the Work of a Specification Section.

C. Form of Submittal: At Final Completion compile two (2) copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

D. Bind warranties and bonds into heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper. Provide separate binders for each building, site and landscape package.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name address and telephone number of the installer.
2. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS," the Project title or name, and the name of the Contractor.
3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

E. Time of Submittal:

1. Submit guarantees/warranties within ten (10) days after date of Notice of Completion, prior to request for Final Payment.
2. For items of Work where acceptance is delayed materially beyond the date of Notice of Completion, furnish updated submittal within ten (10) days after such delayed

acceptance, listing the date of delayed acceptance as the start of the guarantee/warranty period.

1.7 REVIEW MEETING:

A. Eleven (11) months following date of acceptance of the Work, hold a meeting for the purpose of review of, and action upon, guarantees/ warranties, bonds, and service and maintenance contracts, as specified in Section 01 31 13 “PROJECT MEETINGS”.

1.8 SERVICE AND MAINTENANCE CONTRACTS

A. Compile, review, and transmit specified service and maintenance contracts as specified for guarantees/warranties and bonds.

1.9 PREPARATION FOR FINAL INSPECTION

A. Perform final cleaning as specified hereinbefore.

B. Assemble guarantees/warranties, service and maintenance contracts, operating and maintenance instructions, and other items as specified, and transmit to the Construction Manager, who will forward them to the Owner after final acceptance of the Work.

1.10 RESTORATION OF DAMAGED WORK

A. Restore or replace, as specified or determined by the Architect, material and finishes damaged from construction activities at no additional expense to the Owner.

B. Restoration shall be equal to the original Work, and finishes shall match the appearance of existing adjacent Work.

1.11 REMEDIAL WORK

A. Remedial Work necessary owing to faulty workmanship or materials shall be at no additional expense to the Owner.

B. Work shall be coordinated with the Owner and performed at such time and in such manner to cause minimal interruption and inconvenience to the Owner’s operations.

1.12 EXTRA MATERIALS

A. Where required in the individual Specification SECTIONS, furnish extra materials in the quantities and manners specified. Prior to submitting any materials submit a list of all extra material required in the specification sections.

B. Delivery and certification of such extra materials shall be a prerequisite to Notice of Completion.

C. Deliver extra materials directly to Owner for sign-off.

D. Package in clearly identifiable boxes.

E. Indicate manufacturer's name, part name, and stock number.

F. Indicate piece of equipment part or tool is for.

G. Indicate name, address and phone number of closest supplier.

1.13 MISCELLANEOUS RECORD SUBMITTALS

A. Refer to other Specification Sections for miscellaneous record keeping requirements and submittals in connection with various construction activities. Immediately prior to Notice of Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the Construction Manager for the County's records.

B. PART 2 PRODUCTS (not used)

C. PART 3 EXECUTION (not used)

END OF SECTION 01 78 36

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SECTION 01 91 13 – PROJECT COMMISSIONING

PART 1 GENERAL

1.1 SCOPE

A. This section describes the elements of Commissioning common to all Divisions of the project. The requirements listed here are in addition to, or are expected to coordinate with, the requirements in the related documents and specifications.

1.2 RELATED DOCUMENTS

A. Section 01 78 00 - Project Closeout

B. Section 01 78 23 – Operation and Maintenance Data

C. Division 22

D. Division 23

E. Division 26

1.3 RELATED DOCUMENTS

A. Commissioning Plan

1.4 DEFINITIONS

A. Acceptance Testing

B. BoD: Basis of Design. A document that records concepts, calculations, decisions and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document both narrative descriptions and lists individual items that support design process.

C. Commissioning: The systematic process of ensuring that the building's systems are operating in accordance with the Contract Documents, that the systems perform interactively in accordance with the Contract Documents and that Facility Personnel are prepared to operate and maintain the building and its systems. This includes, but may not be limited to, pre-functional testing of equipment, functional testing of systems, system interoperability testing, training of Facility personnel, delivering Operation and Maintenance (O&M) documentation and the turnover of completed systems.

D. Commissioning Authority (CxA): The designated third-party entity that provides oversight and review of the commissioning process in concert with the commissioning team. Owner will engage the CxA under a separate contract.

E. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

F. Contractor: As used in this specification, Contractor refers to the General Contractor, subcontractors, or vendors based on usage

G. FPT

H. Non-Conformance

I. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

J. PFT

K. Systems, subsystems, assemblies, components, and equipment: Where these terms are used together or separately, they shall mean "installed" systems, subsystems, and equipment.

L. Systems Manual: The Systems Manual is the final deliverable from the Commissioning process and provides the information needed to understand, operate, and maintain the facility and its systems. It should be the repository of all updates and corrections as they occur, including those through occupancy. The Systems Manual expands the scope of standard O&M documentation to incorporate additional information developed through the commissioning process and is prepared by the CxA.

M. TAB: Testing, Adjusting, and Balancing.

N. AHJ – Authority Having Jurisdiction.

O. TIO - Testing, Inspection, and Observation Program.

1.5 COMMISSIONING TEAM

A. Members Appointed by Owner:
1. Commissioning Agent
2. Representative of Facility Operations
3. Discipline Engineers of Record
4. Owner
5. AHJ

B. Members Appointed by Contractor: Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.
1. General Contractor's Commissioning Authority
2. Project Superintendent
3. TAB Representative
4. Mechanical Contractor
5. Plumbing Contractor
6. Electrical Contractor
7. Controls Contractor
8. Life Safety Contractors
9. Low Voltage System Contractor(s)
10. Major Equipment Suppliers.

Table 1. Commissioning Matrix

Activity	GC	Owner	TI	A/E	CxA
OPR review		X			R
BOD review				X	R
Cx Specifications		R		X	R
Develop Cx Plan	R	R		R	X
Submittal Review	X			X	R
O&M Manual	X	R	V	R	R
Coordinate Cx schedule	X		V		R
Review test procedure and prepare Full Startup Plan	X				X

Pre-functional Check (PFT) – Full Startup	X		V		R
Compile PC Record	X		V	R	R
Issues Log (PFT & FPT)	R	R	V	R	X
Forms Log (PFT & FPT)	R		V		X
Review test procedure and prepare Full Functional Test Procedure	X		V	R	X
Functional Test (FT) – Full Functional Test	X		V		W
Compile FT Record	X		V	R	R
Sign Off (PFT and FPT)	X	X	X1	X	X
Cx Report		R			X
Systems Manual		R		R	X
Training Enhanced Commissioning	X	R	V	X	R
Warranty (deferred & seasonal test/ correction)	X	R	W		R

Note: This table shows only responsibilities for major activities. See the Cx Plan and Specifications for additional responsibilities. In case of conflict, the Cx Specifications govern.

X = Primary Responsibility

R = Review of documents and comments.

W = Witness of the tests/training.

V = Verification

1.6 OWNER'S RESPONSIBILITIES

A. Select CxA and oversee work product.

B. Prepare the Owner’s Project Requirements (OPR) document. Update the OPR as required throughout the project.

C. Review and approve the Commissioning plan.

D. Provide the BOD documentation, prepared by Architect and approved by the Owner, to the CxA and Contractor.

E. Assign operation and maintenance personnel and schedule them to participate in the commissioning team activities including, but not limited to, coordination meetings, training, testing, and any other demonstrations deemed important.

F. Participate in project commissioning and coordination meetings as required.

1.7 FACILITY OPERATIONS REPRESENTATIVE RESPONSIBILITIES

A. Attend commissioning meetings.

B. Observe Pre-Functional Tests (PFT) and Functional Performance Tests (FPTs) at their discretion.

C. Review training plans, schedule training classes with CxA, attend training sessions.

D. Review Operation & Maintenance manuals.

1.8 COMMISSIONING AUTHORITY'S RESPONSIBILITIES (CXA)

The primary role of the CxA is to provide oversight, support, coordination, review and acceptance of commissioning process and documentation as defined in Specification Sections DIVs 22, 23, 26 with reference to DIVs 11, 13, 14, and 33. The CxA's responsibilities include:

A. Review OPR and BOD for completeness and consistency.

B. Perform Commissioning Design Review prior to mid-construction documents and back-check the review comments in subsequent design submissions.

C. Prepare and update project Commissioning Plan throughout project.

D. Organize and lead the commissioning team.

E. Provide schedule input to the Contractor so that commissioning activities are properly reflected in the construction schedule.

F. Convene commissioning team meetings as required for the purpose of coordination, communication, and conflict resolution; discuss progress of the commissioning processes.

G. Review submittals for commissioned systems concurrent with Architect and Engineer review.

H. Review Pre-functional Test checklists prepared by others or prepare Pre-functional Test checklists for the systems as indicated on the Commissioning Matrix (Table 1), from manufacturer's Field Installation Verification checklist and Equipment Startup Verification checklist furnished by equipment supplier through the installation contractor.

I. Verify that equipment Pre-functional Testing supports initial startup.

J. Witness Pre-functional test execution and start-up of systems and components at the discretion of the CxA.

K. Review and accept completed Pre-functional Test Procedures.

L. Review Functional Performance Test checklist prepared by others or Prepare Functional Performance Test Procedures for the systems as indicated on the Table 1 - Commissioning Matrix. Submit Functional Performance Test procedures for review and acceptance by the Engineer of Record and contractors.

M. Witness, direct, and document Functional Performance Tests.

N. Document all testing deficiencies in a Commissioning Issues Log which describes design, installation, and performance issues that are at variance with the Contract Documents, and is used to track issues as they are encountered, documenting the status of corrective actions and unresolved issues.

O. Prepare Systems Manual from input from Contractor.

P. Review and comment on O&M Manuals submitted by Contractor.

Q. Provide oversight and verification of Facility and Staff Training by reviewing the training plan, instructional materials, and instructor's qualifications; participating in pre-instruction conference, coordinating of the training scheduling meeting, confirming training took place, and reviewing training video.

R. Attend pre-substantial completion meetings as required.

S. Prepare a Final Commissioning Report.

T. Review building operation 10 months after substantial completion.

U. Perform site observations of MEP installation.

1.9 AHJ RESPONSIBILITIES

A. Attend commissioning team meetings.

B. Perform tests and inspections as outlined in TIO.

C. Coordinate planned tests and inspections with CxA to maximize efficiency of both parties and to eliminate duplication of effort wherever possible.

1.10 ARCHITECT/ENGINEER OF RECORD RESPONSIBILITIES

A. Participate in Commissioning Meetings.

B. Respond to issues identified in the Commissioning Design Review.

C. Provide Design Intent and Acceptance Criteria as required to support development and performance of Functional Performance Tests.

D. Review and accept Functional Performance Test procedures.

E. Review the operation and maintenance manuals and provide comments and final acceptance of package.

F. Provide Final Approval of TAB report.

1.11 CONTRACTOR'S RESPONSIBILITIES (GC AND SUB-CONTRACTORS)

A. Provide a CxA as a single point contact for the General Contractor.

B. CxA to coordinate subcontractors, vendors, manufacturers, and testing agencies as required to support Commissioning activities.

C. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to CxA for incorporation into the Commissioning Plan. Update the schedule as required throughout the construction period.

D. Create a Master Equipment List that identifies all commissionable equipment by tag number, manufacturer, model number, location and drawing number.

E. Review the Commissioning Plan.

F. Provide submittals, RFIs, operation and maintenance manuals, and as-built drawings of commissioned systems to the CxA for review.

G. Incorporate Commissioning activities and testing pre-requisites into the general construction schedule and provide updated schedules on a periodic basis.

H. Provide manufacturer's checklists including Field Installation Verification checklists and Equipment Startup checklists to the CxA upon approval of submittals for Pre-functional checklist development. In the absence of a supplier provided Checklist, the contractor can submit their own manufacturer approved.

I. Prepare Pre-functional Test checklist for the systems as indicated on the Commissioning Matrix (Table 1), from manufacturer's Field Installation Verification checklist and Equipment Startup Verification checklist furnished by equipment supplier through the installation contractor and submit PFTs to CxA for review.

J. Submit sample TAB balancing forms for review prior to starting work.

K. Notify Architect and Commissioning team two weeks prior to initial startup of equipment.

L. Perform Pre-Functional Tests and Manufacturer start-up checklists and submit to CxA for review.

M. CxA to collect and compile the completed pre-functional checklists from the contractors and maintain a log of the progress of these checklists for CxA review upon request.

N. Evaluate performance deficiencies identified in test reports and, in collaboration with the Commissioning Agent and entity responsible for system and equipment installation, recommend corrective action.

O. Certify in writing that the system is operational and complete and ready for acceptance testing (TAB complete, BMS complete, PFT complete) and equipment Startup complete.

P. Review, comment, and accept CxA developed Functional Performance Tests.

Q. Prepare Functional Performance Test Procedures for the systems as indicated on the Table 1 - Commissioning Matrix. Submit Functional Performance Test procedure for review and acceptance by the Engineer of Record and CxA.

R. Execute Functional Performance Tests at the direction of the CxA and the Table 1 - Commissioning Matrix.

S. Operate and maintain the equipment/systems during Commissioning process and until turn over to Owner.

T. Provide training plans, materials, and training as specified in Section 01 78 00, "Project Closeout".

U. Assemble the O&M Manuals and System Manual input as specified in Section 01 78 23, "Operation and Maintenance Data" and as described in this specification.

V. Notify the CxA as soon as possible of any issue identified during construction that may affect the Commissioning or final system performance.

W. Coordinate installation of systems and equipment suppliers, suppliers, control contractor, mechanical contractor, and electrical contractor. Verify that coordination, installation, quality control, and contractor testing have been completed such that installed systems and equipment comply with construction documents.

1.12 CONTROLS CONTRACTOR RESPONSIBILITIES

A. Provide CxA and mechanical contractor with controls wiring diagrams, sequences of operations, graphics, and software documentation and printouts, prior to the performance of the Functional Performance procedures.

B. Provide written checklists and procedures to be used performance of Control System Checkout and Testing and Control System Demonstration and Acceptance, to CxA for review prior to execution.

C. Complete Control System Checkout and Testing and submit completed startup checklists to CxA.

D. Perform Control System Demonstration and Acceptance Testing as described in Section 26 96 09. Testing to address and include all testing in CxA prepared FPTs.

E. Assist in performance of Functional Performance Testing of **all** systems controlled and monitored by BMS by demonstrating satisfactory compliance with Sequence of Operations.

F. Participate in the correction, fine-tuning or troubleshooting of system performance if either of these measures becomes necessary. Loop tuning is a specific requirement of the final commissioning work.

G. Train the owner, TAB contractor, and the CxA, in basic operation of the control system and provide required passwords.

H. Provide as-built Sequence of Operations for CxA to incorporate into systems manual.

1.13 TEST, ADJUST, AND BALANCE (TAB) CONTRACTOR RESPONSIBILITIES

A. Provide CxA and mechanical contractor with TAB plan and associated balancing documentation, preliminary if necessary, in time for use in performing functional testing.

B. Coordinate balance activities with activities of the mechanical and controls contractors. Verify that coordination, installation, quality control and final subcontractor's testing have been complete to allow proper balancing work to be performed.

C. Test and balance the system per specification requirements.

1.14 MAJOR EQUIPMENT SUPPLIERS AND/OR THIRD PARTY TESTING AGENCIES RESPONSIBILITIES

A. Provide Installation Checklists and Startup checklist from manufacturer to the purchaser/installing contractor or prepare Pre-functional Test checklist for the systems and submit to CxA for review.

B. Provide documentation of inspections of the installation when required.

C. Provide documented reports of proper startup when required.

D. Perform startup when required by the specs for equipment provided with document report.

E. Prepare Functional Performance Test Procedures for the systems. Submit Functional Performance Test procedure for review and acceptance by the Engineer of Record and CxA.

F. Execute Functional Performance Tests at the direction of the CxA.

1.15 COMMISSIONING DOCUMENTATION

A. Owner's Project Requirements prepared by Owner.

B. Basis of Design document prepared by Design Team.

C. Commissioning Design Review and Back Check Documentation.

D. Commissioning Plan.

E. Completed Pre-functional Tests and Checklists.

F. Completed Functional Performance Tests.

G. Commissioning Issues Log.

H. Final Commissioning Report.

I. Operation and Maintenance (O&M) Manuals as described in Section 01 78 23, "Operation and Maintenance Data."

J. Systems Manual: A supplement to the O&M manual prepared by the CxA with information furnished by the Contractor.

K. Training Plan, materials, instruction, evaluations, attendance lists and videography in accordance with Section 01 78 00, "Project Closeout".

PART 2 EXECUTION

2.1 COMMISSIONED SYSTEMS

A. The systems to be commissioned are shown in the Commissioning Plan. The Commissioning Plan also shows the lead responsible party for execution of the various commissioning tasks on a system basis.

2.2 OVERVIEW OF COMMISSIONING PROCESS

A. This section describes the general sequence of events for commissioning activities, including but not limited to, the following:

1. Design Phase
   a. OPR is prepared by Owner and updated throughout project as needed.

b. BOD is prepared by Design Team and updated throughout project as needed to document how Owner's Project Requirements are satisfied.
c. CxA performs review of OPR and BOD for consistency and completeness.
d. CxA prepares Commissioning Plan.
e. CxA performs Commissioning Design Review prior to 50% CD phase and documents incorporation of comments in subsequent design submission.

2. Construction Phase
   a. CxA performs submittal review of commissioned systems concurrent with Architect and Engineers review.
   b. Contractor provides manufacturer's installation and start-up checklists to CxA to support development of Pre-Functional Test Procedures.
   c. CxA develops Pre-Functional Test Procedures.
   d. Contractor executes Pre-functional Test Procedures and submits to CxA for review.
   e. CxA develops Functional Performance Test procedures.
   f. Contractor and Architect review and accept Functional Performance Test Procedures.
   g. Pre-functional testing complete, TAB testing complete, BMS acceptance testing complete.
   h. Contractor certifies systems are ready for testing (all PFTs complete, TAB complete, BMS acceptance testing complete).
3. Acceptance Phase
   a. Functional Performance Testing performed.
   b. Training of Operations and Facility Staff performed.
   c. O&M and System Manuals prepared and submitted.
4. Occupancy Phase
   a. Submit Final Commissioning Report.
   b. Perform 10-month post-substantial completion review.

2.3 SYSTEMS COMMISSIONING REQUIREMENTS

A. This section provides additional details on the execution of several commissioning processes that are not defined elsewhere

B. General: System and equipment commissioning includes all requirements noted in Section 22 04 05, "Commissioning of Plumbing", section 23 08 05, "Commissioning of HVAC ", section 26 96 09, "Electrical Commissioning and Field Testing and NFPA 70E Requirements ", and as described here.

C. Commissioning Plan
   1. Commissioning Plan is prepared by CxA prior to Construction-Phase Commissioning Kick-off meeting.
   2. Draft Commissioning Plan is coordinated with General Contractor and Owner for review and comment.
   3. CxA issues Commissioning Plan.
   4. CxA updates Commissioning Plan throughout project as required.

D. Incorporation of Commissioning Requirements in Construction Documents
   1. The CxA will develop and incorporate the commissioning requirements into the construction documents.
   2. Commissioning Requirements to include: Commissioning Team involvement, Contractor's responsibilities, Submittal review procedures for commissioned systems, Operations and Maintenance documentation including systems manuals, Meetings, Construction verification procedures, Startup plan development and implementation, Functional Performance Testing, Acceptance and Closeout, Training, and Warranty review site visit.

E. Commissioning Design Review
   1. CxA performs review of commissioned systems prior to mid-construction document phase
   2. Review findings are documented in log and provided to Owner.

3. Architect/Engineer reviews and responds to review findings and updates construction documents as required.
4. CxA performs back-check review of subsequent issue of construction documents to confirm incorporation of resolved items.

F. Commissioning Agent Review of Submittal Documents
1. CxA identifies submittals associated with commissioned systems that will be reviewed.
2. Contractor provides CxA copies of requested submittals concurrent with review performed by Architect and Engineer.
3. CxA provides comments to Owner and Architect.
4. Architect incorporates CxA comments at their discretion.

G. Pre-Functional Testing
1. The Contractor is responsible for completing systems and sub-systems so they are fully functional and meet the design intent of the contract documents. This is demonstrated in part by the successful completion of pre-functional testing, including the manufacturers start-up checklist. The responsibility for the operation of the system and components remains with the Contractor throughout the performance of the commissioning.
   a. Contractor provides CxA with Manufacturer's instructions including installation and start-up checklists upon submittal approval (Ref. Specification 01 33 00).
   b. CxA or GC develops PFT checklists for each Commissioned system and component.
   c. Contractor reviews and approves CxA prepared PFT checklists.
   d. Contractor executes PFT and manufacturers start-up checklists. Executed PFT, manufacturer's checklist and log are maintained by Contractor for review by CxA.
   e. Pre-functional test results will be reviewed by the CxA and provided to AE/Owner for review. If test results are not satisfactory, the General Contractor/responsible subcontractor shall see that corrections are made and reschedule pre-functional testing as soon as possible after corrective work is completed.
   f. Contractor resolves all issues identified during testing and retests system.
   g. Contractor provides all completed PFTs to CxA at the end of Construction Phase for inclusion in final commissioning report.

H. Functional Performance Testing
1. Where applicable, the functional performance tests and checklists are developed in accordance with the acceptance testing requirements as specified in the BEES. Acceptance testing is required by the BEES to ensure that equipment, controls, and systems operate as required by the standards. Similar to commissioning, the acceptance testing process includes visual inspection of equipment and the functional testing of equipment per the prescribed testing procedures found in the standards. The systems covered by the acceptance testing requirement are detailed in Sections 120.5, 120.6, 130.4 and 140.9. While the acceptance testing requirements may overlap, the Commissioning requirements may go beyond the acceptance test requirements. The acceptance testing is mandatory for certain nonresidential lighting. Only a lighting Acceptance Test Technician (ATT) certified by an ATT Certification Provider (ATTCP) may perform testing for indoor and outdoor lighting systems and controls. Refer to specification Section 26 08 13 – Acceptance Testing for Electrical Commissioning and Field Testing and NFPA 70E requirements.
2. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems if both CxA and GC concur. The commencement of system testing before full completion does not relieve the Contractor of the responsibility of fully completing the system, including all pre-functional checklists as soon as possible.
   a. CxA or GC prepares Functional Performance Test (FPT) for all systems which are not tested by third-party or the sub-contractor/manufacturer.
   b. Engineer and Contractor review and accept FPTs.
   c. Contractor and CxA certify that all PFTs and start-up tests are complete and accepted.
   d. Contractor and CxA certify that TAB is complete and accepted.

e. FPTs developed by the CxA are performed by Contractor under the direction of the CxA. Third-party testing, and sub-contractor/manufacturer testing described in Table 1 – Commissioning Matrix is subject to CxA oversight and review of testing results.
f. CxA documents results of all CxA-prepared Functional Performance Tests.
g. Functional Performance Test results will be reviewed by the CxA and submitted to AE/Owner for review and approval. If test results are not satisfactory, exceptions will be identified and documented in the issues log. The General Contractor/responsible subcontractor shall see that corrections are made and reschedule functional performance testing as soon as possible after corrective work is complete.
h. Unforeseen Deferred Tests: If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of pre-functional checklists and functional testing may be delayed upon approval by the CxA and Owner.
i. When the testing plan indicates specific seasonal testing, appropriate initial performance tests shall be completed and documented and additional tests scheduled.

I. O&M and System Manuals
1. O&M Manuals shall be provided as described in Specification 01 78 23.
2. Contractor shall provide input for the System Manual including:
a. System single-line drawings
b. As-built sequence of operations
c. Control Shop Drawings
d. Original Control Set-points
e. Operating Instructions for integrated systems
f. Recommended schedule for maintenance requirements if not already included in O&M Manuals
g. Recommended retesting schedule and blank test forms
h. Sensor and actuator calibration schedules
i. General operating procedures
j. Recommended operational record keeping procedures

J. Training
1. Training shall be provided to Maintenance and Staff Personnel as described in Specification 01 78 00 and as required by the individual specification sections.

K. Post-Occupancy Review
1. CxA performs post-occupancy review of building operations 10 months after substantial completion.
2. Contractors shall correct identified deficiencies under manufacturer's or contractor warranties.
3. Contractors shall update System Manual submittals as required to address findings of Post-Occupancy Review.

END OF SECTION

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PROJECT MANUAL FOR

MONO COUNTY PUBLIC WORKS DEPARTMENT

MONO COUNTY NEW JAIL

NEW CONSTRUCTION

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OSFM Submittal Specifications
VOLUME 2 of 3

September 11, 2023

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PROJECT MANUAL

FOR

MONO COUNTY PUBLIC WORKS DEPARTMENT
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SECTION 02 30 00

SUBSURFACE INVESTIGATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Geotechnical Engineering Report:

1. A Geotechnical Engineering Report has been prepared for the site of this Project by Construction Materials Engineers, Inc., 300 Sierra Manor Drive, Suite 1, Reno, Nevada, 89511, phone: 775-851-8205.
2. The report is titled as: Geotechnical Investigation, Mono County Jail, 221 Twin Lakes Road, APN 08-080-007, Bridgeport, Mono County, California.
3. The report number is: 2753, dated April 19, 2021.

B. Use of Data:

1. This report was obtained for use in Project design and is referenced for Contractor's information only.
2. Contents of the report referenced in this Section do not constitute a warranty of subsurface conditions.
3. Copies of this report can be obtained, upon request, at Architect's office.
4. Contractor shall visit the site to verify existing conditions.

1.2 QUALITY ASSURANCE

A. A Geotechnical Engineer/Testing Laboratory will be retained and paid by Owner to observe performance of work in connection with excavating, trenching, placing of compacted fill and backfilling operations and at the conclusion of the excavations to provide the following services:

1. Determine if the soil at the bottom of the excavations is suitable as a base for the structure.
2. Determine if compacted fill, backfill or any other required fill meets the requirements of the Specifications.
3. Determine if imported fill materials comply with the specified requirements.
4. Determine necessary adjustments in moisture content of soil, size of equipment, thickness of layers, and any tests as may be required to ensure a properly placed fill conforming to applicable requirements of Specifications.
5. Observation and testing by Geotechnical Engineer/Testing Laboratory shall be provided during filling and compacting operations. Contractor shall give at least two working days' notice prior to beginning such operations, to allow proper scheduling of observation and testing work.
6. Field density tests shall be performed by Geotechnical Engineer/Testing Laboratory after compaction of each layer of fill. Where compaction equipment has disturbed the surface to a depth of several inches, density tests shall be taken in the compacted material below the disturbed surface. Additional layers of fill shall not be placed until the field density tests indicate that the specified density has been obtained.

B. If Contractor fails to meet technical or design requirements of the Contract Drawings and requirements/recommendations of Geotechnical Engineering Report, necessary readjustments shall be made until all work is deemed satisfactory by Geotechnical Engineer/Testing Laboratory, and Architect.

   1. No deviation from Specifications shall be permitted without written acceptance from Architect.

C. Differing Site Conditions: Report differences observed between actual conditions at the site and the conditions indicated in Geotechnical Engineering Report immediately upon discovery. Report the nature and extent of differences to Owner and Architect orally to permit early verification of the conditions, and concurrently submit it in writing.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Removal of designated construction.

B. Identification of utilities.

C. Demolition requirements.

1.2 RELATED SECTIONS

A. Division 01 Sections, as applicable.

1.3 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 01.

B. Accurately record actual locations of capped utilities and subsurface obstructions.

1.4 REGULATORY REQUIREMENTS

A. Perform work of this Section under provisions of CBC Chapter 33, CFC Chapter 33, and NFPA 241 for demolition work, safety of structure, dust control and safety of occupants.

B. Obtain required permits from authorities.

C. Do not close or obstruct egress width to exits.

D. Do not disable or disrupt building fire or life safety systems without three-day prior written notice to Owner.

E. Conform to procedures applicable when discovering hazardous or contaminated materials.

1.5 SCHEDULING

A. Schedule work under the provisions of Division 01.

B. Describe demolition removal procedures and schedule.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PREPARATION

A. Provide, erect and maintain temporary barriers as required.

B. Erect and maintain temporary partitions to prevent spread of dust, odors and noise to adjoining facilities.

C. Protect existing materials and finishes that are not scheduled or otherwise required to be demolished.

D. Mark location of utilities.

3.2 DEMOLITION REQUIREMENTS

A. Conduct demolition to minimize interference with adjacent and occupied buildings.

B. Maintain protected egress and access to the Work.

3.3 DEMOLITION

A. Disconnect, remove, cap and identify designated utilities within demolition areas.

B. Demolish in an orderly and careful manner. Protect existing supporting structural members and materials.

C. Except where noted otherwise, remove demolished materials from site. Do not bury or burn materials on site.

D. Remove demolished materials from site as Work progresses. Upon completion of Work, leave areas in clean condition.

E. Remove temporary Work.

END OF SECTION

SECTION 03 11 00

CONCRETE FORMING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete formwork, shoring, bracing, and anchorage.

B. Concrete formwork accessories.

C. Foam infill at elevated concrete.

1.2 RELATED SECTIONS

A. Section 03 20 00 – Concrete Reinforcing.

B. Section 03 30 00 – Cast-In-Place Concrete.

C. Section 31 22 00 – Grading.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ACI 301 – Specifications for Structural Concrete.
2. ACI 347 – Guide to Formwork for Concrete.
3. AHA A135.4 – Basic Hardboard.
4. ASTM C177 – Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
5. ASTM C203 – Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation.
6. ASTM C272 – Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
7. ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
8. ASTM C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
9. ASTM D696 – Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer.

10. ASTM D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
11. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
12. ASTM E1643 – Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
13. PS 1 – Structural Plywood.

1.4 DESIGN REQUIREMENTS

A. Design, engineer, and construct concrete formwork, shoring, and bracing in accordance with design and code requirements, resulting in cast-in-place concrete conforming to required shape, line, and dimension.

1.5 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data: Submit manufacturer's descriptive literature and product specifications for the following:
   1. Foam infill.
   2. Accessories:
      a. Chamfer strips.
      b. Keyed construction joint.
      c. Form ties.
      d. Form release agent.

C. Shop Drawings: Indicate dimensions, materials, bracing, and location of joints and ties.

1.6 QUALITY ASSURANCE

A. Conform to ACI 347 for design, fabrication, erection, and removal of forms.

B. Field Samples: Provide only as requested by Architect.

C. Pre-Installation Meetings:
   1. Conduct pre-installation meeting in accordance with Division 01.
   2. Convene pre-installation meeting prior to commencing work of this Section.
   3. Coordinate work in this Section with work in related Sections.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Architectural Cast Concrete Finish:
   1. Phenolic-faced plywood (minimum 167 g/m² on both faces); minimum 5/8 inch thickness; conforming to PS 1 APA HDO Plyform Class II or better; sound, undamaged sheets with clean, true edges, joints taped.

B. Smooth Concrete Concealed from View: Plywood; 5/8 inch minimum thickness; conforming to PS 1 APA B-B Plyform Class II or better.

C. Concrete Concealed from View:

1. 2x lumber, plywood conforming to PS 1 APA Plyform Class II or better, tempered concrete form hardboard conforming to AHA A135.4, or other acceptable material.

D. Foam Infill at Elevated Concrete: Type VII extruded polystyrene rigid foam insulation. Product: Dow Building Solutions Styrofoam Highload 60 or accepted equal with the following characteristics:

1. Thermal Resistance, per inch, at 75 degrees F mean temp., ft2•h• degrees F/Btu, R-value, minimum: 5.0 per ASTM C177 and ASTM C518.
2. Compressive Strength: 60 psi, minimum per ASTM D1621.
3. Water Absorption, percent by volume, maximum (24 hour water immersion): 0.3 per ASTM C272.
4. Water Vapor Permeance: 0.8 perms per ASTM E96.
5. Maximum Use Temperature: 165 degrees F.
6. Coefficient of Linear Thermal Expansion, in/in• degrees F: 3.5×10^{-5}, per ASTM D696.
7. Flexural Strength: 75 psi minimum per ASTM C203.
8. Complies with ASTM C578, Type VII.
9. Edges: Square.
10. Thickness: As indicated on Drawings.

2.2 ACCESSORIES

A. Chamfer Strips: Wood, metal, or rubber strips; size as shown on Drawings, minimum 3/4 inch by 3/4 inch.

B. Expansion Joint Filler: Refer to Section 03 30 00.

C. Foam Board Separation: Expanded polystyrene in size and thickness to suit application.

D. Keyed Construction Joint: Minimum 24 gauge galvanized steel; shaped with formed key (minimum 1-1/2 inch) for load transfer; and with knockouts for dowel placement.

1. Basis-of-Design Product: G-33 Screed Key Joint by Dayton/Richmond Concrete Accessories, Miamisburg, OH; 800-745-3700; www.daytonrichmond.com. Provide the named product or accepted equal.

E. Form Ties: Provide as indicated and as required.

1. Galvanized steel; adjustable length; cone type; snap-off type with 1 inch back break dimension; free of defects that could leave holes larger than 1 inch in concrete surface.
2. Substitution: In lieu of galvanized steel ties, Contractor may use stainless steel form ties of equal or higher strength.
    a. Stainless Steel Form Tie System:
        1) Stainless Steel Snap Tie, Product No. A-44 by Dayton Superior, Miamisburg, OH; 800-745-37000; www.daytonsuperior.com.

2) Stainless Steel Snap Ties by Meadow Burke, Tampa, FL; 877-518-7665, www.meadowburke.com.

3) Or accepted equal.

F. Plastic Stakes: At Contractor's option, solid plastic stakes may be used in lieu of wood and steel stakes. Provide solid plastic stakes for use in areas with continuous vapor retarder.

1. Basis-of-Design Product: VaporStake™by VaporStake LLC, Chino Hills, CA; 714-519-4211, www.vaporstake.com.

2. Material: Non-corrosive, leak-resistant, solid PVC, with one pointed end and multiple pre-drilled holes for nailing; diameter and length as recommended by stake manufacturer, and as required by field conditions.

G. Nails, Spikes, Lag Bolts, Through-Bolts, Anchors: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

H. Spreaders: Metal; use of wood spreaders will not be permitted.

I. Form Release Agent: Commercially formulated form release agents that will not bond with, stain or adversely affect concrete surface, and will not impair subsequent treatment of concrete surfaces, nor impede the wetting of surfaces to be cured with water or curing compounds. Product shall meet the VOC requirements at the location of use.

1. Product: Duogard as manufactured by W.R. Meadows or accepted equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine job site conditions and verify field dimensions.

B. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 EARTH FORMS

A. Concrete may be placed against cut earth where feasible, conforming to the following criteria:

1. Earth form trenches shall be able to stand without caving in.

2. Sluffage will not be permitted.

3. When, in the opinion of the Building Official and Architect, soil conditions do not require formwork per CBC Section 1808.8.5.

B. Hand trim sides and bottoms of earth forms. Remove loose soil prior to placing concrete.

3.3 FOAM INFILL AT ELEVATED CONCRETE

A. Install per manufacturer's recommendations in the location and thickness as indicated on Drawings.

3.4 FORMWORK ERECTION

A. Erect formwork, shoring, and bracing in accordance with ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit ease of dismantling and stripping and prevent damage to concrete during stripping.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Obtain approval from Architect before framing openings not specifically indicated on Drawings.

F. Perform electrical and mechanical work requiring concrete formwork under provisions of this Section.

G. Stakes (wood and metal) used to support formwork or reinforcement, will not be permitted to occur within finished concrete work.

1. Pulling of stakes and puddling concrete in after concrete placement will not be permitted.
2. Locate non-plastic stakes appropriately to prevent embedment of stakes in the concrete after placement.
3. Plastic stakes, when used in areas with vapor retarder, shall not be removed.
4. Seal plastic stakes with vapor retarder manufacturer’s sealing mastic in accordance with ASTM E1643 and Section 03 30 00 requirements.
    a. Dip pointed side of plastic stake in mastic before driving through vapor retarder to seal the stake perimeter at penetration.

3.5 FORM RELEASE AGENT APPLICATION

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent.

D. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.6 INSERTS, EMBEDDED PARTS AND OPENINGS

A. Locate and set in place items which will be cast directly into concrete.

B. Coordinate work of other Sections such as but not limited to openings, slots, reglets, recesses, chases, sleeves, bolts, anchors and other inserts.

C. Install accessories in accordance with manufacturer's instructions, straight, level and plumb. Ensure items are not disturbed during concrete placement.

D. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

3.7 CONSTRUCTION JOINTS

A. Refer to Section 03 30 00.

B. Locate construction joints so as not to impair the strength of the structure and only at locations indicated on Drawings and as acceptable to Architect. Form keys in cold joints as shown or required.

3.8 UNDERSLAB VAPOR RETARDER

A. Protect underslab vapor retarder from damage at all times.

3.9 FORMWORK CLEANING AND INSPECTION

A. Inspect erected formwork, shoring and bracing to ensure that work is in accordance with formwork design and that supports, fastenings, wedges, ties, and embedded items are secure to prevent displacement and distortions.

B. Clean forms and adjacent surfaces as formwork is erected and prior to concrete placement. Remove wood chips, sawdust, dirt, and other debris.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain through cleaning ports.

D. Close temporary openings with tight fitting panels, flush with inside face of forms and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.10 ADJUSTMENTS

A. When a concrete pour has been stopped for a sufficient length of time so that shrinkage or warp has separated the forms and the concrete, provide for form adjustment to draw the forms into firm contact with concrete before placing additional concrete. Take precautions to prevent any shoulder or ledge from being formed at a cold joint.

3.11 FORM REMOVAL

A. Refer to Section 03 30 00.

B. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

C. Remove forms progressively and in accordance with ACI 347.

3.12 FORM REUSE

A. Forms in good condition may be reused.

B. Clean and inspect forms prior to reuse. Do not re-use split, warped, delaminated, or otherwise damaged forms that will impair surface condition and quality of cast concrete exposed to view.

C. Do not reuse wood formwork more than three times for concrete surfaces to be exposed to view. Do not patch formwork.

3.13 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 347.

B. Concrete work out of alignment, level or plumb will be cause for rejection of the whole work affected and, if so rejected, such work shall be removed and replaced, as directed by Architect, at no cost to Owner.

C. All concrete exposed to view, except as otherwise indicated and specified shall have a smooth finish of uniform texture, free from form marks or other visible irregularities and free from form coating, oils or other matter that will prevent bonding of patching work, painting or other finish materials.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel reinforcement and accessories for concrete and concrete unit masonry.

1.2 RELATED SECTIONS

A. Section 03 11 00 – Concrete Forming.

B. Section 03 30 00 – Cast-In-Place Concrete.

C. Section 04 22 00 – Concrete Unit Masonry.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 301 – Specifications for Structural Concrete.
3. ACI 318/318R – Building Code Requirements for Structural Concrete and Commentary.
4. ACI SP-66 – ACI Detailing Manual.
5. ASTM A615/A615M – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
6. ASTM A706/A706M – Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
7. ASTM A1064/A1064M – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
8. AWS D1.4 – Structural Welding Code – Reinforcing Steel.
9. CRSI Manual of Standard Practice.
10. Wire Reinforcement Institute (WRI) Manual of Standard Practice.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data: Submit manufacturer's descriptive literature, installation instructions, and product specification for the following products:

1. Mechanical splicing devices.
2. Bar supports.

C. Placement Drawings:

1. Prepare in accordance with ACI SP-66.
2. Indicate bar sizes, spacing, locations, and quantities of steel reinforcement and wire fabric, bending and cutting schedules, and supporting and spacing devices.
3. If fusion welding is used, identify which members will utilize fusion welding process for preassembly, including details indicating the size/location of stirrups and holding wires, and welding requirements.
4. Identify placement drawings with reference to sheet and detail numbers from the Contract Documents.
5. Do not use scaled dimensions from Drawings to determine lengths of steel reinforcement.
6. Submit one copy of reproducible placement drawings in addition to those required by Division 01.
7. Contractor shall be responsible for correctness and completeness of steel reinforcing requirements.
8. Begin fabrication only when placement drawings have been accepted.

D. Samples:

1. Bar supports: One for each type and grade.
2. Mechanical splicing devices: One of each type.

E. Quality Assurance/Control Submittals:

1. If fusion welding is used, submit complete shop welding program outlining the type of fusion welding machine to be used and periodic inspection of the in-plant welding.
2. Submit certified copies of mill test reports of reinforcing materials analysis to Owner's testing agency.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with CRSI Manual of Standard Practice; ACI 301; and 2022 California Building Code (CBC) Chapter 17 "Special Inspections and Tests", and Chapter 19 "Concrete", and as follows:

1. Steel Reinforcement, Tests and Materials: CBC Section 1903 "Specifications for Tests and Materials".
2. Anchorage: CBC Section 1901.3.4.
3. Reinforcing Bar Welding: Per Section 1705, Table 1705.3 "Required Special Inspections and Tests of Concrete Construction".

B. Structural Tests and Inspections: Refer to project Enforcement Agency Structural Tests and Inspection Sheet.

C. Fusion welded reinforcing steel shall have one tensile test taken from one specimen sampled per 2.5 tons or fraction thereof for each size of reinforcing steel fusion welded. No bend test is necessary. The specimen shall have a holding wire attached to it that need not be removed. The elongation requirements shall comply with the ASTM of reinforcing steel specified. Test results shall be submitted to the Engineer of Record and the Authority Having Jurisdiction. Testing and inspection costs for fusion welding shall be paid for by the Contractor.

D. Pre-Installation Meetings:

1. Conduct pre-installation meeting in accordance with Division 01.
2. Convene pre-installation meeting prior to commencing Work of this Section.
3. Coordinate Work in this Section with Work in related Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver steel reinforcement in bundles marked with identification tags.

C. Handle and store materials to prevent damage and contamination, excessive rusting or coating with grease, oil, or other objectionable materials.

D. Store steel reinforcement, fabricated assemblies, and accessories off the ground on platforms, skids, or other supports.

E. Deliver and store welding electrodes in accordance with AWS D1.4.

PART 2 PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60, low-alloy deformed steel bars.

B. Reinforcing Steel Indicated to be Welded: ASTM A706/A706M, Grade 60, low-alloy deformed steel bars.

C. Holding Wires: ASTM A1064/A1064M.

D. Welded Wire Fabric: ASTM A1064/1064M; 65 ksi minimum yield strength; fabricated from as-drawn steel wire into flat sheets (rolled fabric not permitted).

1. Size: As indicated on Drawings.

E. Tie Wire: Black annealed steel wire; No. 16 gauge.

2.2 ACCESSORIES

A. Bar Supports (Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place): Provide in accordance with CRSI Manual of Standard Practice from steel wire, plastic, or precast concrete or fiber-reinforced concrete of equal to or greater compressive strength than surrounding concrete. Provide as follows:

1. Footings: Precast concrete blocks with tie wires.

2. Slab on ground: Precast concrete blocks, plastic coated steel fabricated with bearing plates, or specifically designed wire-fabric supports fabricated of plastic.
3. Where legs of wire bar supports contact forms: CRSI Class 1 plastic-protected or CRSI Class 2 stainless steel bar supports.
4. Where support is no closer to concrete surface than 1/2 inch: CRSI Class 3 wire supports.
5. Supports placed against ground: Precast concrete blocks not less than 4 inch square with embedded wire.

B. Welding Materials For Reinforcing Steel:
1. Weld Filler Material: AWS D1.4; low hydrogen, 80 ksi tensile strength.

C. Mechanical Splices: Splicing devices capable of developing 125 percent of the specified yield strength of the bar in compression and tension.
1. Metal Sleeve with Cast Filler Metal:
a. Acceptable Product: Cadweld Rebar by Erico International Corporation, Solon, OH; 800-248-2677; www.erico.com, or accepted equal.
2. Mechanical Threaded Connections: Provide threaded mechanical connections using a metal coupling sleeve with internal threads.
a. Acceptable Product: Lenton Couplers by Erico International Corporation DB-SAE Dowel Bar Splicers by Dayton Concrete Accessories, Miamisburg, OH; 800-745-3700, www.daytonconcreteacc.com, or accepted equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine job site conditions and verify field dimensions.

B. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 PREPARATION

A. Clean steel reinforcement of rust and mill scale, earth, moisture, and other foreign materials before fabrication or placement.

3.3 STEEL REINFORCEMENT FABRICATION

A. Fabricate to shapes, dimensions, and tolerances in accordance with accepted placement drawings conforming to CRSI Manual of Standard Practice, ACI SP-66, ACI 318/318R, ACI 117, and CBC Chapter 19.

B. Standard Hooks and Bends: Conform to ACI 318/318R.

C. Bending: Cold bend steel reinforcement in the field or at the mill. Heating for bending is not permitted unless otherwise specifically allowed by Architect.

D. Reinforcement must not be straightened or re-bent without approval of Structural Engineer of Record (SEOR) and Authority Having Jurisdiction.

E. Weld steel reinforcement in accordance with AWS D1.4.

F. Fusion welding is only permitted for locations identified in this Section:

1. Fusion welding of reinforcing is permitted at holding wires to ties, stirrups, and hoops in beams, columns, and grade beams to preassemble reinforcing steel cages. Fusion welding is not permitted to longitudinal reinforcing steel in any beam, column, or grade beam. The holding wire area shall not exceed 5 percent of the beam, column, or grade beam cross sectional longitudinal steel area.
2. Fusion welding of holding wires to the ends of reinforcing steel placed in mats (spread footings, slab reinforcing, etc.) is permitted provided the fusion weld occurs within 6 bar diameters of the free end of the bar. Fusion welding of holding bars is not permitted at the end of coupled, T-headed, or weld-spliced bars.
3. Fusion welding of holding wires shall not occur on a bent portion of a reinforcing bar. After holding wire has been fusion welded to a reinforcing bar, that reinforcing bar may not be bent where the fusion weld occurs.

3.4 PLACEMENT

A. Place steel reinforcement in accordance with accepted placement drawings in conformance with tolerances specified in ACI 117.

B. Install steel reinforcement in largest practical lengths. Accurately position, support, and secure reinforcement against displacement. Locate support reinforcement with bar supports to maintain minimum concrete cover.

C. Secure reinforcement against displacement within tolerances permitted in ACI 318, Article 7.5.2. Point wire tie ends away from forms.

D. Concrete Cover: Refer to Drawings. Cover tolerances shall comply with ACI 117.

E. Laps: Refer to Drawings.

1. Offset laps in adjacent bars.

F. Splices:

1. Splice reinforcing as shown.
2. Tie lap splices securely to prevent displacement during concrete placement.
3. Install mechanical splice in accordance with manufacturer’s written instructions.
4. Locate splices only where shown and accepted by Architect.

G. Welding:

1. Welding is not permitted unless specifically detailed on Drawings or accepted by Architect.
2. Employ shielded metal-arc method. Comply with AWS D1.4.
3. Welding is not permitted on bars where the carbon content is not known or is determined to exceed 0.75 percent.
4. Welding is not permitted within two bar diameters of any bent portion of a bar which has been bent cold.
5. Welding of crossing bars is not permitted.

H. Maintain minimum clear distance between parallel bars at not less than 1-1/2 times nominal bar diameter, 1-1/2 times maximum size of coarse aggregate, or 1-1/2 inch.

I. Dowels: Place where indicated on Drawings. Grease loose end to prevent concrete from bonding to dowel. Sleeves may be used when accepted by Architect.

J. Dowels for Masonry Reinforcement: Coordinate with masonry work reinforcement requirements. Match masonry reinforcing steel. Refer to Section 04 22 00.

K. Welded Wire Fabric: Install in longest practical lengths on bar supports to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps to avoid continuous laps in either direction. Tie lap joints at 12 inches on center.

L. Field Adjustments: Move steel reinforcement as necessary to avoid interference with other reinforcing steel or other embedded items within accepted tolerances.

1. Sleeves and embedded items: Do not cut bars to clear sleeves or slots through slabs or walls. Wrap bars around these openings.
2. Openings: Compensate for steel reinforcement terminated at openings in slabs by placing one half of steel reinforcement terminated on each side of openings for the full span length.
3. Steel reinforcement moved to avoid interference with other reinforcements, conduits, or embedded items, including additional steel reinforcement to meet structural requirements are subject to inspection and approval before concrete placement.

3.5 FIELD QUALITY CONTROL

A. General: Comply with requirements of Division 01.

B. Testing Service: Owner will select and pay for independent testing agency, which will perform the following:

1. Inspect shop and field welding per AWS D1.4, including checking materials, equipment, procedures, and welder qualifications.
2. Inspector shall employ non-destructive testing or any other aid to visual inspection deemed necessary to assure adequacy of weld.
3. Additional requirements for testing and inspection: Refer to Structural Drawings.

3.6 PROTECTION

A. Protect steel reinforcement from damage and displacement.

B. Protect for potential rust staining of adjacent surfaces. Wrap steel reinforcement with impervious tape or other methods as accepted by Architect. Remove protective cover and clean reinforcement before concrete placement.

C. Install safety caps on all exposed ends of vertical steel reinforcement that pose a danger to life safety.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cast-in-place concrete.

B. Concrete admixtures.

C. Curing and surface slab treatment.

D. Grouting, bonding, and patching materials.

E. Accessories:
   1. Underslab vapor retarder with pipe boots.
   2. Expansion joints.

F. Precast concrete wheel stops.

1.2 RELATED SECTIONS

A. Section 03 11 00 – Concrete Forming.

B. Section 03 20 00 – Concrete Reinforcing.

C. Section 04 22 00 – Concrete Unit Masonry.

D. Section 05 31 00 – Steel Decking.

E. Section 05 50 00 – Metal Fabrications.

F. Section 07 26 50 – Vapor Emission Control System.

G. Section 07 92 00 – Joint Sealants.

H. Section 09 65 00 – Resilient Flooring.

I. Section 09 68 13 – Tile Carpeting.

J. Divisions 21-23 – Mechanical Sections, as applicable to the Project.

K. Divisions 25-28 – Electrical Sections, as applicable to the Project.

L. Section 31 22 00 – Grading.

M. Section 33 31 00 – Sanitary Sewerage Piping.

N. Section 33 42 11 – Stormwater Gravity Piping.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. ACI publications 221R, 302.1R, 302.2R, 304R, 305R, 306R, and 309R contain recommended practices for concrete work. Submit any proposed deviations from these recommendations to Architect for review prior to commencing concrete work.

D. Referenced Standards:

1. ACI 117 – Specification for Tolerances for Concrete Construction and Materials.
2. ACI 221R – Guide for Use of Normal Weight and Heavyweight Aggregates in Concrete.
3. ACI 301 – Specifications for Structural Concrete.
4. ACI 302.1R – Guide for Concrete Floor and Slab Construction.
5. ACI 302.2R – Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
6. ACI 304R – Guide for Measuring, Mixing, Transporting, and Placing Concrete.
7. ACI 305R – Guide to Hot Weather Concreting.
8. ACI 305.1 – Specification for Hot Weather Concreting.
9. ACI 306R – Guide to Cold Weather Concreting.
10. ACI 306.1 – Standard Specification for Cold Weather Concreting.
11. ACI 309R – Guide for Consolidation of Concrete.
12. ACI 318 – Building Code Requirements for Structural Concrete.
13. ACI SP-15 – Field Reference Manual: Specifications for Structural Concrete ACI 301-10 with Selected ACI and ASTM References.
14. ASTM C31/C31M – Standard Practice for Making and Curing Concrete Test Specimens in the Field.
15. ASTM C33 – Standard Specification for Concrete Aggregates.
16. ASTM C39/C39M – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
17. ASTM C94/C94M – Standard Specification for Ready Mixed Concrete.
18. ASTM C109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
19. ASTM C114 – Standard Test Methods for Chemical Analysis of Hydraulic Cement.
20. ASTM C143/C143M – Standard Test Method for Slump of Hydraulic Cement Concrete.

21. ASTM C150 – Standard Specification for Portland Cement.
22. ASTM C157/C157M – Standard Test Method for Length Change of Hardened Hydraulic-Cement, Mortar and Concrete.
23. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete.
24. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete.
25. ASTM C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
26. ASTM C260 – Standard Specification for Air Entraining Admixtures for Concrete.
27. ASTM C309 – Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.
28. ASTM C348 – Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
29. ASTM C494/C494M – Standard Specification for Chemical Admixtures for Concrete.
30. ASTM C595 – Standard Specification for Blended Hydraulic Cements.
31. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
32. ASTM C881/C881M – Standard Specification for Epoxy Resin Base Bonding Systems for Concrete.
33. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
34. ASTM C928 – Standard Specification for Packaged, Dry, Rapid Hardening Cementitious Materials for Concrete Repairs.
35. ASTM C939 – Standard Test Method for Flow of Grout for Preplaced Aggregate Concrete (Flow Cone Method).
36. ASTM C989 – Standard Specification for Slag Cement for Use in Concrete and Mortars.
37. ASTM C1028 – Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull Meter Method.
38. ASTM C1059 – Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
39. ASTM C1077 – Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
40. ASTM C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
41. ASTM C1116/C1116M – Standard Specification for Fiber-Reinforced Concrete.
42. ASTM C1315 – Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
43. ASTM C1602/C1602M – Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.

44. ASTM D882 – Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
45. ASTM D1709 – Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
46. ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
47. ASTM D4397 – Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
48. ASTM E96/E96M – Standard Test Methods for Water Vapor Transmission of Materials.
49. ASTM E154 – Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
50. ASTM E329 – Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
51. ASTM E1155 – Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.
52. ASTM E1643 – Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
53. ASTM E1745 – Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
54. ASTM F1249 – Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
55. ICC-ES AC32 – Acceptance Criteria for Concrete with Synthetic Fibers.
56. ISO/IEC/EN 17025 – General Requirements for the Competence of Testing and Calibration Laboratories (formerly ISO/IEC Guide 25-1990 and ASTM E548).
57. NRMCA – Quality Control Checklist – Section 2.
58. NRMCA – Plant Certification Checklist – Section 3.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data: Submit manufacturer's descriptive literature and product specification for each product. Include manufacturer's written instructions and installation procedures.

C. Drawings: Submit concrete pouring plan showing proposed locations of construction and control joints for review by Architect prior to concrete placement.

D. Samples: Submit product samples when requested by Architect or testing laboratory.

E. Quality Assurance/Control Submittals:

1. Certificates:
    a. Manufacturer's Certification of Compliance that materials (cementitious materials, aggregates, and admixtures) conform to specifications.
    b. Manufacturer's certificate of compatibility stating that admixtures, slab curing materials, and surface treatments are compatible with subsequent floor finishes and adhesives.
2. Reference Documents: Maintain one copy of ACI SP-15 on site.
3. Concrete Mixture Design Submittal Checklist located at the end of this Section.
4. Concrete mixture proportions and characteristics for each class/type of concrete used.
5. Concrete mixture proportion data for each class/type of concrete used:
    a. Calculation of required average compressive strength and supporting test records.
    b. Documentation indicating proposed mixture proportions will produce an average compressive strength greater than the required average compressive strength, including field strength test records or trial mixtures.
    c. Provide documentation in accordance with Concrete Mix Design Submittal Checklist located at the end of this Section.
6. Test Reports.
7. Batch Ticket: Furnish accepted batch tickets at the time of delivery for each concrete load. Indicate on each ticket equipment used for measuring and quantities, by weight, of cement, sand, each class of aggregate, admixtures, and amount of water in the aggregate, water added at the batching plant, and any water withheld at the batch plant. In addition, include mix number, total yield in cubic yards, date and time of day (dispatch time, plant departure time, site arrival time, unloading start and end time).
8. Concrete Placement Record: Keep a record on site including time and date of concrete placing for each portion of the structure for the duration of the project. Record additional information not included in batch ticket such as admixtures added at the job site. Make records available to Architect for review. Submit record to Architect at project completion.
9. Protection of Slabs and Foundations: Submit plans for protection of slabs and foundations, including the following, if applicable:
    a. Cold Weather Concreting: Comply with submittal requirements of ACI 306.1.
    b. Hot Weather Concreting: Comply with submittal requirements of ACI 305.1.
10. Submit documentation from manufacturer indicating the recommended synthetic macro fiber dosage.

F. Closeout Submittals:

1. Concrete placement record.
2. Show location of embedded utilities in record drawings.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Concrete Supplier: Firm specializing in products specified in this Section with a minimum five years documented experience; successfully supplying similar materials (design, content, and performance) as specified in this Section.

2. Concrete Batch Plant: Complies with requirements of ASTM C94 and is currently certified per NRMCA Plant Certification Checklist - Section 3 or other certification acceptable to Architect.
3. Contractor's Design Laboratory: Under the direction of civil engineer licensed by the State of California; conforming to ASTM E329 and ASTM C1077.
4. Independent Testing Laboratory: Conforming to ASTM E329, ASTM C1077, and ISO/IEC/EN 17025, acceptable to Architect.

B. Structural Tests and Inspections: Refer to project Enforcement Agency Structural Tests and Inspection Sheet.

C. Regulatory Requirements: Conform to requirements of 2022 California Building Code (CBC), Chapter 19, "Concrete", Chapter 17 "Special Inspections and Tests", and as follows:
1. Materials:
a. Cementitious Materials: CBC Chapter 19, Section 1903 "Specifications for Tests and Materials".
2. Inspection: CBC Chapter 17, Section 1705 "Required Special Inspections and Tests" Article 1705.3 "Concrete Construction", as applicable.

D. Drying Shrinkage Test: Perform per ASTM C157/C157M modified as follows:
1. Prepare 4 inch x 4 inch x 11 inch prisms with an effective gage length of 10 inches fabricated, cured, dried, and measured per ASTM C157/C157M except that specimens shall be removed from molds at an age of 23 hours +/- 1 hour after trial batching, and shall be placed immediately in water at 73 degrees F +/- 3 degrees for at least thirty minutes, and shall be measured within thirty minutes thereafter to determine original length and then submerged in saturated lime water at 73 degrees F +/- 3 degrees.
2. Measurement to determine expansion expressed as a percentage of original length shall be made at seven days. This length at seven days shall be the base length for drying shrinkage calculations. Specimens shall then be stored immediately in a humidity control room, maintained at 73 degrees F +/- three degrees F and fifty percent +/- four percent relative humidity for the remainder of the test.
3. Measurements to determine shrinkage expressed as a percentage of base length shall be made and reported separately for 7, 14, and 21 days of drying after 7 days of moist curing.

E. Quality Control: Comply with NRMCA Quality Control Checklist – Section 2.

F. Materials Quality Assurance: Obtain cement and aggregates from same source for the duration of the work unless specifically accepted by Architect.

G. Pre-Installation Meetings:
1. Conduct pre-installation (pre-pour) meeting in accordance with Division 01.
2. Convene pre-installation (pre-pour) meeting one week prior to commencing work of this Section attended by concrete supplier.
3. Meeting minutes shall be taken and distributed to meeting attendees within three days of meeting.
4. Coordinate work in this Section with work in related Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Store cement and other cementitious materials in weathertight buildings, bins, or silos which exclude moisture and contaminants and keep building materials completely separated.

D. Arrange and use aggregate stockpiles in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of aggregates. Do not store aggregates directly on ground unless a sacrificial layer is left undisturbed.

E. Refer to manufacturers' product data sheets for recommended shelf life and storage conditions for admixtures.

F. Clearly and accurately label materials after containers have been opened.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. BASF Corporation – Admixture Systems, Cleveland, OH; 800-228-3318, www.basf-admixtures.com.
2. BASF Corporation – Building Systems, Shakopee, MN; 800-433-9517, www.buildingsystems.basf.com.
3. Fibermesh Company – Division of Propex Concrete Systems, Corp., Chattanooga, TN; 800-621-1273, www.fibermesh.com.
4. Grace Construction Products – W. R. Grace & Co., Cambridge, MA; 877-423-6491, www.na.graceconstruction.com.
5. Pecora Corp., Harleysville, PA; 800-523-6688, www.pecora.com.
6. Raven Industries Inc, Sioux Falls, SD; 800-635-3456, www.ravenind.com.
7. Reef Industries, Inc., Houston, TX; 800-231-6074, www.reefindustries.com.
8. Sika Corporation, Lyndhurst, NJ; 800-933-7452, www.usa.sika.com.
9. Sika Scofield, Los Angeles, CA; 800-800-9900, www.scofield.com.
10. Stego Industries, LLC, San Clemente, CA; 877-464-7834, www.stegoindustries.com.
11. The Euclid Chemical Co., Cleveland, OH; 800-321-7628, www.euclidchemical.com.
12. Tremco, Beachwood, OH; 800-852-9068, www.tremcosealants.com.
13. US Mix Products Co., Denver, CO; 800-397-9903, www.usspec.com.
14. W. R. Meadows, Inc., Hampshire, IL; 800-342-5976, www.wrmeadows.com.

B. Substitutions: Manufacturers and products are listed in this Section to establish minimum requirements as to quality and performance. Comply with requirements of Division 01 for substitutions.

2.2 CONCRETE MATERIALS

A. Cementitious Materials:

1. Cement: ASTM C150, Type II/V, low alkali (equivalent alkalis (Na_2O + 0.658K_2O) no more than 0.6 percent per ASTM C114), gray.
2. Supplementary Cementitious Materials (SCM):
   a. Fly Ash: ASTM C618, Class F or Class N. Class C is not permitted.
   b. Slag Cement: ASTM C989, Grade 100 or Grade 120.

B. Aggregates: Aggregates used in concrete shall have a combined aggregate distribution similar to the aggregates used in the concrete represented by field test data or used in trial mixtures. Fine and coarse aggregates: ASTM C33. Low-shrinkage producing coarse aggregates per ACI 221R; and uniformly graded as follows:

Sieve Number or Size in Inches	Percent Retained by Weight		
	1-1/2 inch Max.	1 inch Max.	3/4 inch Max.
2 inch	0-5	–	–
1-1/2 inch	0-8	0-5	–
1 inch	8-18	0-8	0-5
3/4 inch	8-18	8-18	0-8
1/2 inch	8-18	8-18	8-18
3/8 inch	8-18	8-18	8-18
No. 4	8-18	8-18	8-18
No. 8	8-18	8-18	8-18
No. 16	8-18	8-18	8-18
No. 30	8-18	8-18	8-18
No. 50	0-18	0-18	0-18
No. 100	0-8	0-8	0-8
No. 200	0-8	0-8	0-8

1. Maximum Nominal Size of Coarse Aggregate: CBC Section 1903“Specifications for Tests and Materials”, and as follows:
   a. 1/5 the narrowest dimension between sides of forms,
   b. 1/3 depth of slab, or
   c. 3/4 the minimum clear spacing between individual reinforcing bars or wires, or bundles of bars.
2. Aggregate sources shall not contain any alkali-silica reactive material in accordance with ASTM C33, Appendix XI.

C. Water: Potable and complying with ASTM C1602/C1602M.

2.3 ADMIXTURES

A. General:

1. Manufacturer certified to contain no more than 0.05 percent water-soluble chloride ions by mass of cementitious material. Admixtures containing calcium chloride or thiocyanates not allowed.
2. Compatible with other admixtures and cementitious materials in the concrete mix.
3. Obtain Architect's written acceptance prior to use of admixtures. Use admixtures according to manufacturer's written instructions.

B. Air Entraining Agents: ASTM C260.

1. Acceptable Products:
   a. MasterAir-AE90, MasterAir AE 200, or MasterAir VR 20 by BASF Corporation – Admixture Systems.
   b. Darex AEA by Grace Construction Products.
   c. Eucon Air Mix or Eucon AEA Series by The Euclid Chemical Co.
   d. Or accepted equal.

C. Water Reducing:

1. Normal Range: ASTM C494/C494M, Type A.
   a. Acceptable Products:
      1) MasterPozzolith Series by BASF Corporation – Admixture Systems.
      2) Eucon Series by The Euclid Chemical Co.
      3) WRDA 64 by Grace Construction Products.
      4) Plastocrete 161 by Sika Corp.
      5) Or accepted equal.
2. Mid Range Water-Reducing: ASTM C494/C494M, Type A or Type F.
   a. Acceptable Products:
      1) MasterPolyheed Series BASF Corporation – Admixture Systems.
      2) Eucon Series by The Euclid Chemical Co.
      3) Duracem 55 by Grace Construction Products.
      4) Or accepted equal.
3. High Range Water-Reducing: ASTM C494/C494M, Type F or G.
   a. Acceptable Products:
      1) MasterRheobuild 1000 or MasterGlenium Series by BASF Corporation – Admixture Systems.
      2) Eucon Series or Plastol Series by The Euclid Chemical Co.
      3) Duracem 100 by Grace Construction Products.
      4) Sikament 10 ESL by Sika Corp.
      5) Or accepted equal.

D. Shrinkage Reducing: Reduces dry shrinkage up to 80 percent at 28 days, and up to 50 percent at one year and beyond as tested per ASTM C157/C157M.
   1. Acceptable Products:
      a. MasterLife SRA 20 by BASF Corporation – Admixture Systems.
      b. Eclipse Floor and Eclipse Plus by Grace Construction Products.
      c. Eucon SRA Series or Conex by The Euclid Chemical Co.
      d. Or accepted equal.

E. Set Retarding: ASTM C494/C494M, Type B or Type D.
   1. Acceptable Products:
      a. Pozzolith Series or MasterSet DELVO Series by BASF Corporation – Admixture Systems.
      b. Eucon Retarder Series, Eucon DS, or Eucon Stasis by The Euclid Chemical Co.
      c. Or accepted equal.

F. Set Accelerating: ASTM C494/C494M, Type C or Type E.
   1. Acceptable Products:
      a. MasterSet AC 534 or MasterSet FP 20 by BASF Corporation – Admixture Systems.
      b. Accelguard Series by The Euclid Chemical Co.
      c. Or accepted equal.

G. Workability-Retaining: Shall retain concrete workability without affecting time of setting or early-age strength development. ASTMC494/C494M, Type S.
   1. Acceptable Products:
      a. MasterSure Z 60 by BASF Corporation – Admixture Systems.
      b. Plastol AMP Series by The Euclid Chemical Co.
      c. Or accepted equal.

H. Permeability-Reducing Admixtures: ASTM C494/C 494M, Type S.
   1. Shall be a Portland cement-based crystalline capillary waterproofing admixture that reacts in concrete to form insoluble crystalline hydration products in the capillary pores of concrete.
   2. Shall show a reduction in permeability of concrete compared to an identical concrete mixture without the admixture, when tested in accordance with CRD-C48 at a pressure of 200 psi.
   3. Shall reduce or have no penetration of water compared to an identical concrete mixture without the admixture, when tested in accordance with DIN 1048 for a duration of 96 hours.
   4. NSF-61 certified.
   5. Acceptable Product:
      a. MasterLife 300 Series by Master Builders Solutions.

I. Synthetic Microfibers: 100 percent virgin polypropylene monofilament or fibrillated fibers containing no reprocessed olefin materials, conforming to ASTM C1116, Type III; fiber length 1/4 inch to 3/4 inch multi-design graduation; meets ICC-ES AC32; UL Listed.

1. Acceptable Products:
    a. MasterFiber M or F Series by Master Builders Solutions.
    b. Stealth e3 by Fibermesh Company.
    c. Fiberstrand Series by The Euclid Chemical Co.
    d. Grace Fibers by Grace Construction Products.
    e. Or accepted equal.

J. Synthetic Macrofibers: Specially manufactured for use as concrete secondary reinforcement (temperature and shrinkage reinforcement) conforming to ASTM C1116; polypropylene/polyethylene synthetic macro fiber, Type III, minimum 1-1/2 inch length, and aspect ratio 50 to 90.

1. Acceptable Products:
    a. MasterFiber MAC Series by Master Builders Solutions.
    b. Tuf-Strand SF by The Euclid Chemical Co.
    c. Sikafiber-800 Steath by Sika Corporation.
    d. Or accepted equal.
2. Concrete Mixtures Containing Synthetic Macofibers:
    a. Measure, batch, and mix per ASTM C94 and ASTM C1116.
    b. For exterior concrete as identified on Structural Drawings:
        1) In no case shall dosage rate be less than 1.5 pounds per cubic yard of concrete. Confirm minimum fiber quantity per manufacturer's recommendations.

2.4 CURING MATERIALS AND SLAB TREATMENT

A. General:

1. Comply with regulations of the California Air Resources Board and the local Air Pollution Control/Air Quality Management District.
    a. VOC Limit: 350 g/L.
2. Verify compatibility with subsequent adhesives and coatings before application; furnish Manufacturer's certificate of compatibility. Coordinate with related Sections.

B. Curing Compound: Select as appropriate for compatibility of subsequent adhesives and coatings.

1. Water-emulsion, dissipating resin based; meets or exceed ASTM C309, Type 1, Class B.
    a. Acceptable Products:
        1) Kurez DR-100 by The Euclid Chemical Co.
        2) 1100 by W. R. Meadows, Inc.
        3) US SPEC Maxcure Resin Clear by US Mix Products Co.
        4) Or accepted equal.

C. Waterproof Sheet Materials for Curing: ASTM C171 and as follows:
   1. Curing paper consisting of two sheets of kraft paper adhered together with a bituminous material with embedded cords or strands of fiber running in both directions not more than 1-1/4 inches apart.
      a. Tensile strength in machine direction: Thirty foot-pounds per inch of width minimum.
      b. Tensile strength in cross direction: Fifteen foot-pounds per inch of width minimum.
   2. Polyethylene Film: ASTM D4397; minimum six mil thickness.
   3. White burlap-polyethylene sheeting: Consisting of burlap weighing not less than nine ounces per square yard extrusion coated on one side with at least four mil white opaque polyethylene sheet.

D. Evaporation Retarder: Water-based polymer concentrate, readily dilutable in water.
   1. Acceptable Products:
      a. MasterKure ER50 by BASF Corporation – Admixture Systems.
      b. Eucobar by The Euclid Chemical Co.
      c. US SPEC Monofilm ER by US Mix Products Co.
      d. Or accepted equal.

E. Surface Retarder: Water soluble liquid, formulated to retard wet surface of mortar in concrete.
   1. Acceptable Products:
      a. MBT EAC-S Regular or Deep by BASF Corporation – Admixture Systems.
      b. Sure Etch Series by The Euclid Chemical Co.
      c. Rugasol-S by Sika Corp.
      d. Or accepted equal.

F. Concrete Sealer: Chemically reactive, waterborne solution of inorganic silicate or siliconate materials; odorless, colorless.
   1. Acceptable Products:
      a. SelectSeal Plus by Sika Scofield.
      b. MasterKure HD 200 WB by BASF Corporation – Building Systems.
      c. Eucosil by The Euclid Chemical Co.
      d. Aqua-Trete SG by Evonik.
      e. US SPEC Industraseal by US Mix Products Co.
      f. Or accepted equal.

G. Vapor Emission Control System: Refer to Section 07 26 50.

2.5 GROUTING, BONDING, AND PATCHING MATERIALS

A. Grout:
   1. Non-shrink Grout: ASTM C1107, non-metallic aggregate grout; 7000 psi minimum 28-day compressive strength at fluid water ratio per ASTM C939.
      a. Acceptable Products:
         1) MasterFlow 928 by BASF Corporation – Building Systems.

2) NS Grout, Hi-Flow Grout, or Euco Pre-Cast Grout by The Euclid Chemical Co.
3) US SPEC MP Grout by US Mix Products Co.
4) Or accepted equal.

2. Non-shrink Drypack Grout: Non-shrink, natural aggregates, 7000 psi minimum 28-day compressive strength.
   a. Acceptable Products:
      1) MasterFlow 100 by BASF Corporation – Building Systems.
      2) Dry Pack Grout by The Euclid Chemical Co.
      3) Sealtight Pac-it by W.R. Meadows, Inc.
      4) Or accepted equal.

B. Bonding Materials:
   1. Bonding Agent/Admixture:
      a. Interior or exterior applications: Acrylic or SBR, latex cement bonding agent/admixture; non-re-emulsifiable; meets or exceeds ASTM C1059, Type II.
         1) Acceptable Products:
            a) Akkro-7T, Flex-Con, or SBR Latex by The Euclid Chemical Co.
            b) US SPEC Acrylcoat by US Mix Products Co.
            c) Sealtight Acry-Lok by W. R. Meadows, Inc.
            d) Or accepted equal.
      b. Interior applications or exterior applications not subject to constant water immersions: Ethyl-vinyl acetate (EVA) copolymer liquid bonding agent and admixture; re-emulsifies once and will not re-wet; meets or exceeds ASTM C1059.
         1) Acceptable Products:
            a) Tammsweld by The Euclid Chemical Co.
            b) US SPEC Multicoat by US Mix Products Co.
            c) Or accepted equal.
   2. Structural Bonding Epoxy Adhesive: Two component, 100 percent solids, 100 percent reactive; meets or exceeds ASTM C881/C881M, Type II, Grade 2, Class B or C as appropriate.
      a. Acceptable Products:
         1) MasterEmaco ADH 1090RS, MasterEmaco ADH 1420, or MasterEmaco ADH 327RS by BASF Corporation – Building Systems.
         2) Dural 452 MV by The Euclid Chemical Co.
         3) Sealtight Rezi-Weld 1000 by W. R. Meadows, Inc.
         4) Or accepted equal.
      b. Adhesives shall comply with regulations of South Coast Air Quality Management District Rule 1168 for VOCs.

C. Self-Leveling Underlayment: Portland cement based, self-leveling 1 inch thick to featheredge. Fast setting – minimum compressive strength 2200 psi after one day; minimum 4000 psi compressive strength at 28 days per ASTM C109.
   1. Acceptable Products:
      a. K-15 Self-Leveling Underlayment Concrete by ARDEX Engineered Cements.
      b. MasterTop 110 SL by BASF Corporation – Building Systems.
      c. Flo-Top or EucoFloor SL 160 by The Euclid Chemical Co.
      d. US SPEC Self-Leveling Underlayment by US Mix Products Co.
      e. Or accepted equal.

D. Repair Mortar: Exceeds ASTM C928, R1 and R2; rapid setting – minimum 1300 psi at three hours; 5500 psi at seven days per ASTM C109.
   1. Acceptable Products:
      a. MasterEmaco T 415/430 or MasterEmaco T 1060/1061 Repair Mortars by BASF Corporation – Building Systems.
      b. Euco-Speed, Versaspeed, or Speedcrete 2028 by The Euclid Chemical Co.
      c. US SPEC Transpatch by US Mix Products Co.
      d. Or accepted equal.

E. Repair Mortar (for patching over steel): Liquid polymer modified, containing an integral corrosion inhibitor, exceeds C928, R2; rapid setting – minimum compressive strength 1500 psi at one day; 3500 psi at seven days; 5000 psi at 28 days per ASTM C109.
   1. Acceptable Products:
      a. MasterEmaco N 350CI with Acrylic Additive or MasterEmaco T 310CI by BASF Corporation – Building Systems.
      b. Concrete-Top Supreme by The Euclid Chemical Co.
      c. US SPEC H2 by US Mix Products Co.
      d. Sikatop 122 Plus by Sika Corp.
      e. Or accepted equal.

F. Epoxy Joint Filler: Two component, 100 percent solids, semi-rigid epoxy; hardness: minimum 75 Shore A per ASTM D2240.
   1. Acceptable Products:
      a. MasterSeal CR 190 by BASF Corporation – Building Systems.
      b. Euco 700 by The Euclid Chemical Co.
      c. Sikadur 51 NS by Sika Corp.
      d. Or accepted equal.

2.6 ACCESSORIES

A. Underslab Vapor Retarder, Plastic: Performance shall exceed ASTM E1745, Class A requirements, as modified below. Material properties shall match one of the acceptable products listed below.

1. Properties:
    a. Thickness: Minimum 15 mils (ACI 302.2R, as applicable).
    b. Water Vapor Permeance (as tested before and after ASTM E1745 mandatory conditioning): Maximum 0.01 Perms (based on Test Method ASTM E1745).
    c. Tensile Strength: Minimum 60 lbf/in (ASTM D882).
    d. Puncture Resistance: Minimum 3000 g (ASTM D1709, Method B).
2. Acceptable Products:
    a. VaporBlock VB15 by Raven Industries.
    b. Griffolyn® 15 Mil Green by Reef Industries, Inc.
    c. 15 Mil Vapor Barrier by Stego Industries, LLC.
    d. Perminator 15 Mil by W.R. Meadows, Inc.
    e. Substitutions: Under provisions of Division 01.

B. Vapor Retarder Accessories:

1. Seam Tape: Water vapor transmission rate 0.03 perms or lower, per ASTM E96. Provide seam tape as standard with vapor retarder manufacturer.
2. Vapor Proofing Mastic: Water vapor transmission rate 0.03 perms or lower per ASTM E96 as standard with vapor retarder manufacturer.
3. Boots for Pipe Penetrations: Provide prefabricated pipe boots as standard with vapor retarder manufacturer.

C. Cone Hole Plugs: Precast high strength cement compound plugs matching size and shape of form tie cone and matching color of poured-in-place concrete as provided by same manufacturer of form ties. Refer to Section 03 11 00.

D. Capillary Barrier: Clean crushed rock; 3/4 inch nominal maximum size with no material passing a No. 4 sieve.

E. Expansion Joints:

1. Joint-Filler Strips: ASTM D1751; bituminous type; preformed, resilient, flexible, and non-extruding.
    a. Acceptable Product:
        1) Sealtight Fiber Expansion Joint by W.R. Meadows, Inc.
        2) Or accepted equal.
2. Self-Leveling Polyurethane Sealant: ASTM C920; Type M; Grade P; Class 25; use T and M.
    a. Acceptable Products:
        1) THC 900/901 by Tremco Inc.,
        2) Urexpan NR-200 by Pecora Corp.,

3) MasterSeal SL2 by BASF Building Systems,

4) Or accepted equal.

b. Sealants shall comply with regulations of South Coast Air Quality Management District Rule 1168 for VOCs.

F. Anchors, Anchor Bolts, Nuts, and Washers: Refer to Section 05 12 00.

2.7 PRECAST CONCRETE WHEEL STOPS

A. Provide precast concrete wheel stops, size and shape as indicated on Drawings.

B. Concrete: Precast, air entrained concrete with a minimum compressive strength of 2,500 psi. Provide chamfered corners and drainage slots on underside and holes for anchoring to substrate.

C. Dowels: Galvanized steel, 3/4-inch diameter, 10-inch minimum length. Provide where indicated, or as required by design condition.

2.8 CONCRETE MIX

A. General:

1. Proportion concrete design mixes per ACI 301 Section 4.2.3 and ACI 318 Section 26.4.3.

2. Proportion concrete design mixes per ACI, prepared and tested by an independent testing laboratory acceptable to Architect prior to design mix approval. For each mix design, prepare and perform tests as follows:

a. Drying shrinkage test per modified ASTM C157/C157M as specified in this Section; provide at least three test specimens. Drying shrinkage test not required for below grade concrete.

3. Proportioning without field experience or trial mixtures may be permitted with written approval from Architect, where concrete manufacturer can establish the uniformity of its production for concrete of similar type and strength based on recent test data in accordance with ACI 318, Chapter 26, Article 26.4.4 “Documentation of Concrete Mixture Characteristics”.

4. Proportion concrete design mix to attain compressive strength as specified below and as needed, with early strength to meet Contractor’s work program.

B. Mix Designs: Refer to Structural Drawings for mix design requirements.

1. Maximum Water Content: 300 pounds per cubic yard.

2. Maximum Drying Shrinkage: 0.048 percent as tested per modified ASTM C157/C157M as specified in this Section after 7 days moist curing plus 21 days drying. This requirement does not apply to below grade concrete.

3. For concrete in ACI Exposure Class C2, the maximum water-soluable chloride ion content that is contributed from the ingredients including water, aggregates, cementitious materials, and admixtures shall be determined on the concrete mixture by ASTM C1218 at age between 28 days and 42 days, and shall be less than 0.15 percent by weight of cement.

4. Unless otherwise specified for specific concrete mixes, air entrainment shall be provided for exterior concrete work exposed to freeze-thaw cycles only, such as, site concrete, including pavements, curbs, and gutters.

C. Admixtures:

1. Use specified admixtures as acceptable to Architect. Verify compatibility of concrete admixtures when using multiple admixtures.
2. Synthetic Macrofibers: Use at slabs. Add to mix only at batch plant in accordance with manufacturer's written instructions.

2.9 CONCRETE MIXING

A. Concrete shall be mixed per ACI 304R.

2.10 SOURCE QUALITY CONTROL

A. Owner shall employ a testing laboratory accepted by Architect to perform the following:

1. Review mix designs and certificates of compliance for materials Contractor proposes to use.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine and verify the following prior to concrete placement.

1. Forms are erected, adequately braced, sealed, lubricated (if required), and bulkhead provided where placing is to stop.
2. Thoroughly water soak wood forms other than plywood at least twelve hours before concrete placement.
3. Steel reinforcement are accurately positioned, securely tied and braced. Verify concrete cover requirements.
4. Coordination with related work is completed.
5. Anchors and embedded items are in position, securely held and braced.
6. Construction joints and previously placed concrete are prepared as specified.
7. Compliance with cold-weather or hot-weather requirements.
8. Compliance with cleaning and preparation requirements.

B. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.

C. Concrete formwork, reinforcement, inserts, and embedded items are subject to Architect's acceptance. Notify Architect at least 48 hours prior to concrete placement.

3.2 PREPARATION

A. Capillary barrier below interior slabs shall be compacted using one pass of a smooth drum roller, vibratory roller, or vibratory plate. Compaction shall be verified by Geotechnical Engineer.

B. Underslab Vapor Retarder: Install in accordance with manufacturer's written instructions, ASTM E1643, and as specified in this Section.

1. Lay underslab vapor retarder at interior on-ground concrete work.

2. Apply underslab vapor retarder directly on underlying subgrade, base course, or capillary water barrier. This layer shall be rolled or compacted before placing the underslab vapor retarder.
3. Unroll vapor retarder with longest dimension parallel with direction of concrete placement.
4. Lay vapor retarder using the greatest widths and lengths practicable to eliminate joints wherever possible. Lap over footings and seal to foundation walls.
5. Overlap joints 6 inches and seal with compatible seal tape per manufacturer's written recommendations.
6. Seal all penetrations per manufacturer's written instructions using mastic and seal tape. No penetration of underslab vapor retarder is permitted except for reinforcing steel and permanent utilities.
7. Replace torn, punctured, and damaged underslab vapor retarder material prior to placing concrete.
8. Minor repairs may be made by patches of underslab vapor retarder overlapping edges 6 inches and sealing all four sides with tape.
9. Control concrete placement so as to prevent damage to underslab vapor retarder. Screed pins and similar implements that will puncture underslab vapor retarder are not permissible.

C. Cleaning: Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt and other debris before placing concrete.

D. Refer to Section 03 11 00 for formwork preparation.

E. Refer to Section 03 20 00 for reinforcing steel preparation.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 301 and as specified in this Section.

1. Concrete construction tolerances shall be per ACI 301 except the top surface of concrete supporting masonry construction shall have a maximum vertical deviation from elevation of +/- 1/2 inch.

B. Add no water during delivery and at the project site unless specifically accepted by Architect. If water is withheld at batch plant, indicate in delivery ticket the design water for accepted mix, moisture content of aggregates, and free water added at batch plant. If total water added at plant is less than design water to attain slump of accepted mix design, water may be added to concrete at job site, not to exceed the design water content, subject to the limitations specified in ASTM C94/C94M. If additional slump is required, use water reducing admixture.

1. Any water added to the concrete on-site shall be done in the presence of the County designated material testing agency personnel.

C. Discharge mixed concrete within 1-1/2 hours or before mixer has revolved 300 revolutions, whichever comes first, after the introduction of mixing water to the cement and aggregates. Reduce this time to 45 minutes when the concrete temperature exceeds 85 degrees F, unless appropriate measures as specified in ACI 305.1 are taken to maintain slump and temperature of concrete. Slump and concrete temperature can be maintained within limits longer with the use of retarding admixtures or hydration-control admixtures or ice.

D. Place concrete within fifteen minutes after it has been discharged from the mixer. Handle concrete from mixer to forms in a continuous manner.

E. Deposit concrete as close as possible to its final position in the forms, with no vertical drop greater than five feet except where suitable equipment is provided to prevent segregation and where specifically authorized.

F. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If concrete cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

G. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic to avoid cold joints.

H. Pumping concrete, when specifically accepted, may be conveyed by positive displacement pump such as piston or squeeze pressure type; pneumatic placing equipment is not permitted. Use rigid steel pipe or heavy-duty flexible hose with an inside diameter at least three times the nominal maximum-size coarse aggregate, but not less than 4 inches. Aluminum pipe is not allowed.

I. Provide adequate scaffolding, ramps and walkways in a manner so that personnel and equipment are not supported by in-place reinforcement.

J. Consolidation: Consolidate placed concrete with mechanical vibrating equipment per ACI 309R.

   1. Consolidate each layer of concrete immediately after placing using internal vibrators, except for slabs 4 inches thick or less.
   2. Insert and withdraw vibrators vertically at uniformly spaced location no farther than the visible effectiveness of the vibrator. Hold vibrator stationary and slowly withdraw vertically while operating.
   3. Do not use vibrators to transport concrete inside forms.
   4. Place vibrator to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers that have begun to lose plasticity. Limit vibration duration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.

K. Concrete Floors and Slabs: Deposit and consolidate concrete for floors and slabs in a continuous operation within limits of construction joints until placement of a panel or section is complete.

   1. Consolidate concrete during placement so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   2. Maintain reinforcement in position on chairs during concrete placement.
   3. Screed slab surfaces with a straightedge and strike off to correct elevations.
   4. Slope exterior surfaces for drainage as directed, unless otherwise shown. Slope interior floors to drains uniformly, where provided.

L. Hot Weather Concreting: Place concrete according to ACI 305.1 and as follows:

1. Cool components before mixing to maintain concrete temperature below 85 degrees F at time of placement. Chilled mixing water or chopped ice may be used to control temperature. Calculate and include water equivalent of ice in designed water cement ratio.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.
4. Protect concrete from surface drying; moisture loss from concrete in plastic state shall be maintained below 0.1 pounds per square foot per hour. Methods may include, but are not limited to: evaporation retardant, sun shades, wind breaks, and fog misting.

M. Cold Weather Concreting: Place concrete according to ACI 306.1 and as follows:

1. Protect concrete work from physical damage or reduced strength as a result of frost, freezing, or low temperatures.
2. When ambient temperature is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F and not more than 75 degrees F.
3. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade.
4. Do not incorporate calcium chloride, salt or other materials containing antifreeze agents into the concrete mix.
5. Upon Architect's written acceptance and subject to prior approval of mix design, accelerating admixtures, containing no calcium chloride, as specified in this Section may be used.

3.4 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete, unless otherwise indicated on Drawings.

B. Construction Joints: Locate and install joints as indicated on Drawings or as accepted by Architect, and in a manner that strength and appearance of concrete are not impaired.

1. Comply with ACI 318, Chapter 26, Article 26.5.6.2.
2. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated.
3. Expose concrete aggregates, a minimum of 1/4 inch depth, creating a rough surface using a surface retardant. Within 24 hours after placing concrete, remove retarded surface mortar using either high pressure water jetting or stiff brushing or a combination of both to expose coarse aggregate. A rough surface of exposed aggregate may also be produced by sandblasting followed by high pressure water jetting.
4. Where new concrete joins existing concrete (concrete more than sixty days old), clean and roughen existing concrete to expose coarse aggregate. Coat with epoxy bonding compound prior to placing new concrete.
5. Horizontal Joints: Apply a 1 inch wood grade strip, level and straight, 1/2 inch below the placement lift elevation for a neat joint.

C. Slab-on-Ground Control Joints: Tool or saw-cut weakened plane joints at a depth of at least 1/4 slab thickness where shown on Drawings. Where not indicated in Drawings, provide at distances (in feet) every two times to three times of slab thickness (in inches).

1. Tooled Joint: Form control joints after initial floating by grooving and finishing each joint edge to a 1/8-inch radius. Repeat grooving after applying surface finish.
2. Sawed Joint: Saw cut 1/8-inch width as soon as the concrete has hardened sufficiently to prevent raveling (dislodging of the aggregates) of the edges of the saw cut and completed before shrinkage stresses become sufficient to produce cracking.
3. Fill control joints with epoxy joint filler in accordance with manufacturer's written instructions.

D. Slab-on-Ground Expansion Joints and Isolation Joints: Provide expansion joints and isolation joints where shown on Drawings, where slab abuts vertical surfaces such as curbs, gutters, and sidewalks.

1. Extend joint-filler strips full width and extend to full depth of joint, terminating not less than 1/2 inch and not more than 1 inch from finish surface. Apply a removable capping flush to slab finish.
2. Install strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
3. Remove capping when concrete has cured and apply joint sealant.

E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where shown on Drawings.

3.5 FORMED SURFACES FINISHING

A. Leave texture imparted on formed concrete surface, unless otherwise specified, except that defective surfaces shall be repaired. Repair defective concrete as specified in this Section.

B. Maintain uniform color of the concrete, unless painting of surfaces is required, by using only one mixture without changes in material or proportions for any structure or portion of structure exposed to public view.

C. Repair and patch tie holes. Apply cone hole plugs matching color of cured concrete; and unless otherwise indicated, flush to concrete surface, as provided by form tie manufacturer using waterproof adhesive.

3.6 CONCRETE FLOORS AND SLABS FINISHING

A. Comply with ACI 302.2R and as specified in this Section. Comply with flatness and levelness tolerance requirements of this Section.

B. Float Finish:

1. Immediately following placing and consolidating concrete, begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface.
2. When concrete has sufficiently stiffened begin floating to a true and even plane free of ridges. Perform floating using power-driven equipment or hand floats if area is small or inaccessible to power-driven floats.

3. If bleedwater is present prior to finishing, carefully drag-off or remove by absorption with porous materials such as burlap. Dusting of surfaces with dry cement or other materials or the addition of any water during finishing is not permitted.
4. Check slab surfaces with a ten-foot straightedge at regular intervals while concrete is still plastic, to detect high or low areas.
5. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighten until surface is left with a uniform, smooth, granular texture.
6. Take extreme care during finishing operations to prevent over finishing or to prevent working water into the surface; this can cause crazing (surface shrinkage cracks which appear after hardening) of the surface. Slabs with surfaces exhibiting significant crazing as determined by Architect shall be removed and replaced.

C. Trowel Finish:
1. After floating is complete and after surface moisture has disappeared, apply trowel finish using a power-driven trowel or hand trowel if area is small or inaccessible to power-driven trowel.
2. Steel trowel to a smooth, even, dense finish, free of blemishes including trowel marks.
3. Apply final steel troweling by hand.
4. Hard troweling (steel troweling) of air entrained concrete will not be permitted, unless otherwise indicated on Drawings or specified in other Sections.

D. Broom Finish:
1. After floating, lightly trowel surface and then carefully score by pulling a broom across the surface. Use appropriate type of broom to achieve texture specified.
2. Broom as indicated or as directed by Architect. Where not specifically indicated, broom transverse to traffic or at right angles to the slope of the slab.
3. Adding water to facilitate brooming is not permitted.
4. Exterior ramps, walks, and slabs: Apply a slip-resistant finish as follows:
   a. Where slope is six percent or greater: Heavy broom finish with at least 0.8 coefficient of friction per ASTM C1028.
   b. Where slope is less than six percent: Medium broom finish with a minimum 0.6 coefficient of friction per ASTM C1028.

E. Synthetic Macrofibers Concrete Finishing:
1. Brooming Synthetic Macrofiber Surfaces:
   a. Broom once in one direction only - such as with a fresno/broom.
   b. Do not overlap broom strokes.
   c. Do not start brooming too early as fibers may be pulled from concrete.
   d. Keep broom clean and damp.
2. Troweling or Floating Synthetic Macrofiber Surfaces:
   a. Finish so as to minimize visible fibers at the surface of the concrete.
3. Sawed Joints in Synthetic Macrofiber Concrete.
   a. When an early entry saw is used, cut joints 1-1/4 inches deep for slabs up to 9 inches thick.
   b. When a conventional saw is used, cut joints to minimum 1/3 thickness of slab.

F. Floor and Slab Flatness and Levelness Tolerance: Determine flatness and levelness of floor slabs using the F-Number System in accordance with ASTM E1155 using the inch-pound system of units. Calculate F-Numbers as follows:

1. Definitions:

   a. Face Flatness Number (F_F): The maximum slab curvature allowed over 24 inches computed on the basis of successive 12 inch elevation differentials.

   b. Face Levelness Number (F_L): The relative conformity of the slab surface to a horizontal plane as measured over a ten foot distance.

2. Sampling Requirements: As described in ACI 117.

3. Calculations:

$$F_F = \frac{4.57}{\text{Maximum difference in elevation (in decimals of inches) between successive 12 inch elevation differences.}}$$

$$F_L = \frac{12.5}{\text{Maximum difference in elevation (in decimals of inches) between two points 10 feet apart.}}$$

4. Tolerances:

   a. Trowel finish surfaces on ground: F_F 25; F_L 20 (overall tolerance values).

   b. Float finish surfaces on ground: F_F 20; F_L 17 (overall tolerance values).

   c. Trowel finish surfaces for concrete fill over steel deck: F_F 25.

      1) Depressions in floors between high spots shall not be greater than 5/16 inch below a 10 foot long straight edge.

      2) Top of concrete surface elevation shall not vary by more than ±3/4 inch from the average elevation.

   d. Minimum local tolerance (1/2 bay or as designated by Architect): 2/3 of specified tolerance values.

   e. At water closet/lavatory combination units, the floor flatness value shall be F_F 35 (Flat) or better as described in ACI 117 Table R4.8.4.

5. Refer to Article 3.9 of this Section for remedial work required for out-of-tolerance concrete.

G. Site Concrete Flatness Tolerance: 1/4 inch in 10 feet, non-cumulative; unless more restrictive tolerance is indicated or specified. This tolerance does not allow slopes to exceed the specified maximum slopes.

1. Surface cross slopes shall not exceed one unit vertical in fifty units horizontal (two percent).

2. Portland cement concrete paving shall be stable, firm, and slip resistant and shall comply with CBC Section 11B-302 and Section 11B-403.

3.7 CURING AND PROTECTION

A. Protect freshly placed concrete from premature drying, rapid temperature change, mechanical injury, and injury from flowing water for a curing period not less than seven days. Comply with ACI 306.1 for cold-weather protection and ACI 305R for hot-weather protection during curing.

B. Curing Methods:

1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   a. If curing compound is applied using a hand held, pump-up sprayer, it shall be back-rolled using a short nap roller.

2. Moist Curing: Keep surfaces in a moist condition for not less than seven days using water saturated absorptive cover (burlap-polyethylene sheeting) kept wet continuously. Cover concrete completely in widest practicable width, with sides and ends lapped at least 12 inches, and sealed with waterproof tape or adhesive. Immediately repair and maintain rips and tears and keep traffic away from surface during curing period.

3. Ponding or Immersion: Continuously immerse concrete throughout the curing period in water not more than twenty degrees below the temperature of the concrete.

C. Concrete in Forms: Keep forms and exposed concrete surfaces covered and continuously moist. Provide soaker hoses at top of walls or other accepted means of keeping concrete and forms wet while forms remain in place. If forms are removed before end of curing period, continue curing by methods described in this Section.

D. Floors and Slabs:

1. Evaporation Retarder: Apply evaporation retarder to floors and slabs if hot, dry, or windy conditions cause moisture loss of 0.1 pounds per square foot per hour before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

2. Cure by application of curing and sealing compound or by moist curing. Use appropriate curing method compatible with subsequent floor adhesives and coatings. Moist cure concrete surfaces to receive penetrating liquid floor treatments.

3. Begin curing as soon as free water has disappeared from the concrete surface after placing and final finishing.

E. Protection:

1. Protect concrete surfaces from damage by tools, equipment, materials, and construction activity.

2. Traffic, shoring, or loading will not be permitted on concrete surface until it has sufficiently hardened to prevent injury to finish and strength.

3. Protect all flat work and other surfaces as required with full board of plywood coverings as necessary.

3.8 REMOVAL OF FORMS

A. Formwork for sides of curbs and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees F for 48 hours after placing concrete provided concrete is hard enough not to be damaged by form-removal operations and provided curing and protection operations are maintained.

3.9 CONCRETE REPAIRS

A. General: Comply with ACI 301, Article 1.7 as follows:

1. Completed concrete work shall conform to applicable requirements of this Section and Contract Documents.
2. Concrete work that fails to meet one or more requirements of the Contract Documents but subsequently is repaired to bring the concrete into compliance will be acceptable.
3. Concrete work that fails to meet one or more requirements of the Contract Documents and cannot be brought into compliance with the Contract Documents is subject to rejection.
4. Repair rejected concrete work by removing and replacing or by additional construction to strengthen or otherwise satisfy project requirements as directed by Architect. To bring rejected Work into compliance, use repair methods that meet applicable requirements for function, durability, dimensional tolerances, and appearance as determined by Architect.
5. Submit proposed repair methods, materials, and modifications needed to repair concrete work to meet the requirements of the Contract Documents.
6. Contractor shall be responsible to bring concrete work into compliance with requirements of Contract Documents.

B. Defective Concrete: Repair and patch defective concrete work and concrete not conforming to required lines, details, and elevations. Use materials and methods specified in this Section as accepted by Architect. Serious defects, defects affecting structural strength, or unsatisfactory patching may be cause for complete removal and replacement of concrete.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycomb, rock pockets, and voids more than 1/2 inch in any direction in solid concrete. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with drypack grout before bonding agent has dried. Fill form-tie voids with patching mortar or cone hole plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, repair mortar will match surrounding color. Patch a test area at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed, formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness.

1. Repair defective finished surfaces including spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced section regardless of width, and other objectionable conditions.
2. After concrete has cured fourteen days, correct high spots by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply mortar underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surface in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete. Place, compact, and finish to blend with adjacent finished concrete.
6. Repair random cracks and single holes 1 inch or less in diameter with drypack grout. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place drypack grout before bonding agent has dried. Compact and finish grouted areas to match adjacent concrete.

E. Moist cure patches and repairs for at least 72 hours.

F. Perform concrete structural repairs subject to Architect's acceptance.

3.10 FIELD QUALITY CONTROL

A. General: Comply with requirements of Division 01.

B. Testing Service: Owner will select and pay for independent testing agency.

C. Strength Test Specimen Cylinders: Conduct sampling, curing, and testing per ASTM C172, ASTM C31/C31M, and ASTM C39/C39M. Contractor shall provide moulds required for strength test cylinders. Test samples shall be taken at the point of concrete placement.

1. Frequency: Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 100 cubic yards of concrete, nor less than once for each 5000 square feet of surface area for slabs or walls.
2. A strength test shall be the average of the strengths of at least two 6 inch by 12 inch cylinders or at least three 4 inch by 8 inch cylinders made from the same sample of concrete and tested at the test age designated for the determination of concrete compressive strength.

3. Cylinder Label and Records: Mark and date each test cylinder. Maintain records of test specimen cylinders and send copies to Contractor, Architect, and Owner. Record the following information:
    a. Cylinder identification mark.
    b. Date made.
    c. Concrete supplier.
    d. Slump/slump flow.
    e. Specified concrete design strength.
    f. Pour location and type of structural member.
    g. Compressive strength test date and age.
    h. Admixtures added to concrete mix.
    i. Air content.
4. Compressive Strength Tests: Test laboratory cured specimens at the following ages and report compressive strengths as follows:
    a. 7 days where early compressive strength is required.
    b. 28 days.
    c. 56 days.
    d. Hold specimens for one strength test in reserve.
5. Test Reports: Furnish copies of test reports directly from testing agency to Contractor, Architect, and Owner.

D. Slump Test: ASTM C143/C143M. Conduct slump testing when test cylinders are made and additionally for every 150 cubic yards of concrete. Perform additional tests when concrete consistency appears to change. Slump not meeting slump indicated in accepted mix design (± one inch) will be rejected. Contractor shall provide slump cones.

E. Air Content Tests: ASTM C231 for normal weight concrete. Where air entrainment is specified, conduct air content tests from the first two batches of concrete mixed each day and when test cylinders are made. Concrete not meeting air entrainment requirements shall be rejected and removed.

F. In the event the cylinders tested do not meet the required concrete design strength, conduct core tests and additional tests or inspections as may be required by Architect to ascertain strength of placed concrete. Costs for additional tests and inspections shall be borne by Contractor.

G. Floor Flatness/Levelness: Provide verification of Floor and Slab Flatness and Levelness as indicated in Article 3.6.E of this Section. Furnish copies of report directly from testing agency to Contractor, Architect, and Owner.

END OF SECTION

Concrete Mixture Design Submittal Checklist

- ☐ Specify Use: All mix designs must clearly note the concrete type or use. (i.e. footings, slab on grade, site concrete)
- ☐ Mix Design: Provide concrete mixture designs with proportions and characteristics including all admixtures.
- ☐ Gradation: Provide combined aggregate gradation by weight for all course and fine aggregates.
- ☐ Weight: Provide dry unit weight of mix. Normal weight concrete shall be limited to 145 PCF.
- ☐ Material Certificates: Provide supplier's certification that materials conform to specifications. This includes aggregates, admixtures, and cementitious materials such as cement and fly ash.
- ☐ Product Data: Provide product literature for each product and admixture used. Include manufacturer's specification, written instructions, and installation procedures.
- ☐ Required SCM: Mix design must contain the percentage of supplementary cementitious materials noted in mix design table of the specifications.
- ☐ Admixtures: Where multiple admixtures are used, provide a letter from all manufacturers indicating there are no compatibility problems or adverse effects resulting from combination of products.
- ☐ Shrinkage: Provide shrinkage test per modified ASTM C157/C157M at 21 days. Shrinkage test must be for the same mix specified or a similar mix with the same water cement ratio and aggregate source. (Exception: shrinkage testing is not required for below grade concrete)
- ☐ Testing / Proportion Method: Concrete must be proportioned per the requirements of ACI 301-16. Indicated method used and provide complete test data and documentation for the chosen proportion method.

SECTION 04 22 00

CONCRETE UNIT MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete masonry units (CMU).
   1. Standard.
   2. Insulated.

B. Reinforcement.

C. Insulation.

D. Accessory items.

E. Precast concrete caps.

1.2 RELATED SECTIONS

A. Section 03 20 00 – Concrete Reinforcing.

B. Section 03 30 00 – Cast–In–Place Concrete.

C. Section 07 19 19 – Silicone Water Repellents.

D. Section 09 91 00 – Painting.

E. Divisions 21–23 – Mechanical.

F. Divisions 25–28 – Electrical.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:
   1. ACI 315 – Details and Detailing of Concrete Reinforcement.
   2. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
   3. ASTM C5 – Standard Specification for Quicklime for Structural Purposes.
   4. ASTM C90 – Standard Specification for Loadbearing Concrete Masonry Units.
   5. ASTM C94/C94M – Standard Specification for Ready Mixed Concrete.

6. ASTM C140 – Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
7. ASTM C144 – Standard Specification for Aggregate for Masonry Mortar.
8. ASTM C207 – Standard Specification for Hydrated Lime for Masonry Purposes.
9. ASTM C270 – Standard Specification for Mortar for Unit Masonry.
10. ASTM C272 – Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions.
11. ASTM C303 – Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation.
12. ASTM C404 – Standard Specification for Aggregates for Masonry Grout.
13. ASTM C476 – Standard Specification for Grout for Masonry.
14. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
15. ASTM C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
16. ASTM C1019 – Standard Test Method for Sampling and Testing Grout.
17. ASTM C1364 – Standard Specification for Architectural Cast Stone.
18. ASTM D1056 – Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber.
19. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
20. TMS 402 – Building Code Requirements for Masonry Structures.
21. TMS 602 – Specification for Masonry Structures.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings indicating bar sizes, spacings and locations of reinforcing steel, including reinforcing steel at door, window, and utility openings, bending and cutting schedules, supporting and spacing devices, and location/layout and details of each joint type.

C. Certified Mix Design for block, grout, and mortar with integral water repellent: Include results of testing or test data when used to establish mix proportions for grout.

D. Certificate of conformance stating that masonry units meet or exceed applicable ASTM specifications referenced in this Section.

E. Two full size samples of each type of masonry unit specified, in selected colors.
   1. Two full size samples of insulated block with insulation inserts.

F. Two 12 inch long samples of each type of precast concrete cap.

1.5 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: The masonry work shall comply with the requirements of this Section and, in addition, shall conform to the applicable requirements of TMS 402 and TMS 602, 2022 California Building Code (CBC), Chapter 17 “Special Inspections and Tests”, Chapter 19 “Concrete”, and Chapter 21 “Masonry”.

1. Inspection:

a. Masonry Construction: Per Section 1705 “Required Special Inspections and Tests”, Article 1705.4 “Masonry Construction”.

b. Reinforcing Bar Welding: Per Section 1705, Table 1705.3 “Required Special Inspections and Tests of Concrete Construction”.

B. Single Source Responsibility for Masonry Units: Obtain masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.

C. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality including colors for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate. One cement type shall be used for all mortar throughout the project.

D. Mockup:

1. Mockup shall be constructed and accepted by Architect prior to starting any permanent CMU work.

2. Mockup shall be constructed on the project site at a location to be coordinated with Owner, Architect, and Contractor, and shall be a separate, freestanding sample panel, minimum 6 feet high and 12 feet long, using installation processes and techniques to be used on permanent work, accepted products, and finishes.

3. Mockup shall include the following: Selected CMU colors, finishes, and patterns, bonding, mortar colors, sealant colors, tooled joints, corners, reinforcing, insulation, rake, control, and expansion joints, one window opening, compliance with specified tolerances, and quality of workmanship. Do not grout cells of units. Refer to Drawings for schematic diagram of sample panel.

4. Mockup shall be produced by the workers who will perform the work on the Project.

5. Accepted mockup shall provide a visual quality standard for work and shall remain through completion of the work for use as a quality standard by which subsequent permanent CMU work will be judged. Do not proceed with permanent CMU installation until mockup has been accepted by Architect.

6. Work not meeting the quality standard of the mockup shall be removed and replaced at no cost to the Owner.

7. Maintain mockup undisturbed during construction and dispose of mock-up after all CMU work on project has been completed and accepted.

E. Pre-Installation Meetings:

1. Conduct pre-installation meeting in accordance with provisions of Division 01.

2. Convene pre-installation meeting prior to commencing work of this Section.

3. Purpose of meeting is to review the CMU mockup and to discuss workmanship related to mortar placement for head and bed joints and tooling, block alignment, jamb conditions at openings, corner construction, and rake joints for depth and placement.
4. Take minutes of meeting. Distribute to all attendees and concerned parties within five days.

1.6 DEFINITIONS

A. Grout Lift: The increment of height to which grout is placed into masonry in one continuous operation within a total grout pour.

B. Grout Pour: The total height of masonry to be grouted prior to the erection of additional masonry. A grout pour consists of one or more grout lifts.

C. High-Lift Grouting: Grout pour full height of construction between horizontal cold joints using multiple grout lifts.

D. Low-Lift Grouting: Units laid and grouted to a maximum height of five feet-four inches prior to the erection of additional masonry.

1.7 TESTS AND INSPECTIONS

A. Tests requested by Architect shall be made by a testing laboratory selected and paid for by Owner. Any masonry work failing to meet required design stresses as specified hereinafter shall be dismantled and replaced at no cost to Owner.
   1. Tests requested by Contractor to establish design stresses when tests made by the Testing Laboratory indicate defective masonry shall be paid for by Contractor.

B. Inspection: Approval of the reinforcing steel after installation must be received from Architect and Special Inspector. Architect and Special Inspector shall be notified at least 48 hours in advance of the beginning of grouting operations.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Unload masonry units carefully and store on raised platform. Masonry units shall be maintained under waterproof cover protected from weather.

C. Protect cementitious materials against exposure to moisture. Store cementitious materials off the ground, under cover, and in a dry location. Use of cementitious or other materials that have become caked and hardened from absorption of moisture will not be permitted.

D. Store and protect aggregates where grading and other required characteristics can be maintained.

E. Store and protect masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.

1.9 JOB AND ENVIRONMENTAL CONDITIONS

A. Environmental:

1. Cold Weather Conditions: Do not place unit masonry when temperature is below 40 degrees F unless Architect accepts and Contractor provides means for preventing damage from freezing before and after placement.
2. Hot Weather Conditions: Protect masonry construction from direct exposure to wind and sun when erected; with an ambient air temperature of 99 degrees F in the shade with relative humidity less than fifty percent.

B. Do not apply uniform structural loads on CMU construction for at least 12 hours after constructing masonry walls or columns.

C. Do not apply concentrated structural loads on CMU construction for at least 3 days after constructing masonry walls or columns.

D. Protect all construction from droppings of mortar.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Acceptable Manufacturers, Concrete Masonry Units (CMU):

1. Basalite Block Company, Inc., Dixon, CA; 800-776-6690, 707-678-1901, www.basalite.com.
2. Calstone Company, Sunnyvale, CA; 408-984-8800, www.calstone.com.
3. Angelus Block Co., Inc., Sun Valley, CA; 818-767-8576, www.angelusblock.com.

B. Acceptable Manufacturers and Products, Integral Water Repellent for CMU and Mortar:

1. Grace Construction Products, W. R. Grace & Co. - Conn.; “Dry-Block Block Admixture” for CMU; “Dry-Block Mortar Admixture” for mortar.
2. ACM Chemistries, Inc.; “RainBloc” for CMU, and “RainBloc for Mortar” for mortar.
3. BASF Aktiengesellschaft; Rheopel Plus for CMU; Rheopel Mortar Admixture for mortar and grout.

C. Acceptable Manufacturers, Precast Concrete Caps:

1. Bertelson Precast.
2. Basalite Block Company, Inc.
3. Napa Cast Stone.
4. Cast Stone Systems.
5. Thunderstone, Lincoln, NE; 402-420-2322, www.thunderstone.com.

D. Substitutions: Under provisions of Division 01.

2.2 CONCRETE MASONRY UNITS

A. Hollow Load Bearing Units: ASTM C90, maximum oven dry density of 135 pounds per cubic foot, 2000 pounds per square inch minimum compressive strength. Provide open and closed-end units, bond beams, U beams, half units and any additional special shapes and sizes as required to complete the Work. Units shall be of the following types:

1. Standard:

a. Precision smooth finish, sizes as indicated on Drawings; colors as selected by Architect.

1) 2 inch solid cap block. Provide chamfered edges where indicated on Drawings.

b. Precision smooth finish with three scores, sizes as indicated on Drawings; colors as selected by Architect.

c. Split-face texture one side and exposed ends, sizes as indicated on Drawings; colors as selected by Architect.

2. Insulated:

a. Precision smooth finish double open ended units to receive specified insulation, sizes as indicated on Drawings; colors as selected by Architect.

b. Split-face texture one side and exposed ends, double open ended units to receive specified insulation, sizes as indicated on Drawings; colors as selected by Architect.

B. Provide integral water repellent admixture in concrete mix during manufacture of concrete masonry units. Mixing and proportions shall be in strict accordance with water repellent manufacturer’s printed instructions.

2.3 MORTAR AND GROUT

A. Portland Cement: ASTM C150, Type I, except use Type III for construction below 40 degrees F. Provide natural color or white cement as required to produce required mortar color. Masonry cement will not be permitted.

B. Aggregate:

1. For Mortar: ASTM C144.

2. For Grout: ASTM C404.

C. Hydrated Lime: Type S, ASTM C207.

D. Quick Lime: ASTM C5.

E. Water: Clean and potable, free from impurities detrimental to mortar and grout.

F. Admixtures:

1. Unless otherwise specified, use admixtures only with Architect's acceptance and without adversely affecting bond or compressive strength.

2. Grout Additive: Grout pours greater than five feet-four inches shall contain "Grout Aid" by Sika Chemical Corporation or “Pre-Mix Products Grout Additive” by Valley Abrasive Shot, Inc.

a. Mix grout additive as recommended by manufacturer.

G. Provide integral water repellent admixture in mortar mix. Mixing and proportions shall be in strict accordance with water repellent manufacturer's printed instructions.

H. Color of mortar as selected by Architect. Anticipate a minimum of three different colors.

2.4 REINFORCEMENT, ACCESSORIES, AND RELATED ITEMS

A. Steel reinforcement including anchors, ties and accessories: shall conform to CBC Section 2103.4 "Metal Reinforcement and Accessories."

B. Reinforcing Steel: Same type and quality specified for concrete reinforcing, Section 03 20 00.

C. Wire Ties: No. 16 annealed wire for tying reinforcing steel.

D. Wire Joint Reinforcement: See Drawings for specified type of joint reinforcing.

1. Ladder Reinforcing: 220 Ladder-Mesh joint reinforcement as manufactured by Hohmann & Barnard, Inc. or accepted equal, with the following characteristics:
   a. Joint reinforcement shall conform to ASTM A951/A951M.
   b. Wire Size: 9 gauge side rods x 9 gauge cross rods, cross welded at 16 inches on center.
   c. First cross rods shall be welded 12 inches from each end to allow lap splices.
   d. Ladder shall be hot-dip galvanized after fabrication in conformance with ASTM A153/ASTM A153M. Coating shall be applied at a rate of 1.5 ounces per square foot.
2. Wire Reinforcing: Continuous Wire Reinforcement by Hohmann & Barnard, Inc. or accepted equal, with the following characteristics:
   a. Joint reinforcement shall conform to ASTM A951/A951M.
   b. Wire Size: Continuous 9 gauge cold-drawn steel wire.
   c. Layout lap splices as indicated on Drawings.
   d. Ladder shall be hot-dip galvanized after fabrication in conformance with ASTM A153/ASTM A153M. Coating shall be applied at a rate of 1.5 ounces per square foot.

E. Bonding Agent: MasterEmaco ADH 326 two-component 100 percent solids liquid epoxy bonding adhesive in compliance with ASTM C881, Type II, Grade 2, Class C as manufactured by Master Builders Solutions/BASF, or accepted equal.

F. Control Joints: Closed cell neoprene rubber conforming to ASTM D1056, Grade 2A1. 3/8 inch thick by 3 inches wide. Product: Rapid Expansion Joint DA2015 as manufactured by Dur-O-Wal, a Hohmann & Barnard Company, Hauppauge, NY; 800.645.0616, www.dur-o-wal.com, or accepted equal.

G. Weep Holes: Where weep holes are required, provide medium density polyethylene plastic tubing in lengths and diameter as indicated on Drawings.

H. Insulation: Korfil Hi-R as manufactured by Concrete Block Insulating Systems, Inc. or accepted equal, with the following characteristics:

1. Material: Expanded polystyrene, conforming to ASTM C578, Type X for use in 12 inch wide concrete masonry units.
2. Density: 1.3 pounds per cubic foot minimum per ASTM C303.
3. Thermal Resistance: R-5 per inch of thickness at 75 degrees F.
4. Water Vapor Permeance: 1.1 per inch of thickness.

5. Water Absorption: <1.0 percent volume per ASTM C272.
6. Flame Spread: Less than 5.0 per ASTM E84.

I. Insulation at Open End Units: Korfil Hi-R-H as manufactured by Concrete Block Insulating Systems, Inc. or accepted equal, with the following characteristics:
   1. Material: Expanded polystyrene, conforming to ASTM C578, Type X for use in 12 inch wide concrete masonry units.
   2. Density: 1.3 pounds per cubic foot minimum per ASTM C303.
   3. Thermal Resistance: R-5 per inch of thickness at 75 degrees F.
   4. Moisture Absorption: Less than 1.0 percent by volume per ASTM C272.
   5. Flame Spread: Less than 5.0 per ASTM E84.

J. Insulation at Closed End Units, Lintels, Corners: Korfil ICON as manufactured by Concrete Block Insulating Systems, Inc. or accepted equal, with the following characteristics:
   1. Material: Expanded polystyrene, conforming to ASTM C578, Type X.
   2. Density: 1.3 pounds per cubic foot minimum per ASTM C303.
   3. Thermal Resistance: R-5 per inch of thickness at 75 degrees F.
   4. Moisture Absorption: Less than 1.0 percent by volume per ASTM C272.
   5. Flame Spread: Less than 5.0 per ASTM E84.

2.5 PRECAST CONCRETE CAPS

A. Precast Concrete Caps: Sizes and profiles as indicated on Drawings.

B. Provide precast units complying with ASTM C1364 using either the vibrant dry tamp or wet-cast method.

C. Provide integral water repellent admixture in concrete mix. Mixing and proportions shall be in strict accordance with water repellent manufacturer’s printed instructions.

D. Fabricate units with sharp arrises and accurately reproduced details, with indicated texture on all exposed surfaces.

E. Fabrication Tolerances:
   1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
   2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
   3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.

2.6 MIXES AND MIXING

A. Mortar:
   1. Meet the requirements of CBC Section 2103.2 and ASTM C270 Type S. Mix designs shall meet one of the following criteria:
      a. Conform to the type and proportions of ingredients in compliance with the Proportion Specification of ASTM C270.
      b. Conform to mix design and mortar tests performed in accordance with the Property Specification of ASTM C270.

2. Mortar shall be mixed as follows, with a total mixing time not less than ten minutes.
   a. Place approximately half of required water and sand into mixer while running.
   b. Add cement and remainder of sand and water into mixer in that order and mix for a period of at least two minutes.
   c. Add lime and continue mixing as long as needed to secure a uniform mass.
3. Use and place mortar in final position within 2-1/2 hours after mixing. Mortars that have stiffened due to evaporation of water may be re-tempered with water as necessary to restore required consistency during that time period.

B. Grout:
1. Grout shall conform to the requirements of TMS 602 and shall be a coarse grout designed to attain a compressive strength of not less than 2,000 psi at 28 days.
2. Proportions: Grout shall be proportioned as specified by one of the following methods:
   a. Based on proportions specified in ASTM C476.
   b. Based on laboratory or field experience with the grout ingredients and the masonry units to be used.
      1) For coarse grout, the coarse and fine aggregates shall be combined such that the fine aggregate part is not greater than 80 percent of the total aggregate weight (mass). Coarse grout proportioned by weight shall contain not less than 564 pounds of cementitious material per cubic yard.
      2) If this method is selected, Contractor shall submit documented history of grout mix design and results of test data used to establish mix proportions from no less than ten different recent projects.
      3) Compressive strength shall be determined in accordance with ASTM C1019.
3. Aggregate for grout shall conform to the requirements set forth in ASTM C404, Aggregates for Grout. Coarse grout shall be used in grout spaces 2 inches or more in width and in all filled-cell masonry construction.
4. Materials for grout shall be measured in suitable calibrated devices. After the addition of water, all materials shall be mixed for at least three minutes in a drum type batch mixer. Mixing equipment and procedures shall produce grout with the uniformity required for concrete by ASTM C94.
5. Grout consistency at time of placement shall enable full grouting of all spaces scheduled to receive grout.

2.7 SOURCE QUALITY CONTROL

A. Where required by governing code, Owner's Testing Agency will:
1. Select masonry units by random sampling at the plant and test units for strength, absorption, and moisture content in accordance with ASTM C140; report strengths based on net area.
2. Review mix designs for mortar and grout.
3. Review certificates of compliance for materials. Sample and test where non-conformance is suspected.
4. Perform masonry and grout tests.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive masonry and verify following:
   1. That foundation surface is level to permit bed joint with range of 1/4 inch to 1-1/4 inch.
   2. That edge is true to line to permit protection of masonry to less than 1/4 inch.
   3. That projecting dowels are free from loose scale, dirt, concrete, or other bond-inhibiting substances and properly located.

B. Do not begin work before unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean concrete surfaces to receive masonry. Remove laitance or other foreign material lodged in surfaces by sandblasting or other means as required.

B. Ensure masonry units are clean and free from dust, dirt or other foreign materials before laying the units.

C. Establish lines, levels and coursing. Protect from disturbances.

D. Provide temporary bracing during erection of masonry work. Maintain in place until masonry has set to provide permanent bracing.

E. Insulation: Insulation inserts shall be installed in the cores of blocks at the block manufacturer's plant, ready for delivery to the project site. Inserts shall be properly installed in accordance with the insulation manufacturer's installation instructions to allow blocks to be handled without insert dislodgment. Blocks containing damaged inserts will not be accepted.

3.3 COURSING

A. Install unit masonry work in accordance with CBC Chapter 21.

B. Place unit masonry to lines and levels indicated to the following tolerances, as well as tolerances indicated in TMS 602:
   1. Variation from unit to adjacent unit: 1/8 inch maximum.
   2. Variation from plane to wall: ±1/4 inch in 10 feet; ±3/8 inch in 20 feet; ±1/2 inch maximum.
   3. Variation from plumb: ±1/4 inch in 10 feet; ±3/8 inch in 20 feet; ±1/2 inch maximum.
   4. Variation of level coursing: 1/4 inch in 10 feet; 1/2 inch maximum.
   5. Variation of joint thickness: ±1/8 inch.

C. Bond: Use running bond typical unless otherwise noted. Lay concrete masonry units with vertical joints located at center of unit in course below.

D. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.

E. Preserve the vertical continuity of cells in concrete unit masonry. The minimum clear horizontal dimensions of vertical cores shall be 3 inches by 3 inches for an 8-inch wide block.

3.4 PLACING AND BONDING

A. Do not install concrete masonry units which are wet, cracked, broken or chipped beyond ASTM C90 finish and appearance tolerances.

B. Lay only dry concrete masonry units.

C. Perform jobsite cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.

D. Lay units with bed and head joints filled from the faces of the units to a distance in not less than the thickness of the face shell.

1. Webs shall be fully mortared in all courses of piers, columns, and pilasters, and when necessary to confine grout or insulation.
2. Vertical cells to be grouted shall be aligned and have unobstructed openings for grout.
3. Buttering of joint corners and deep or excessive furrowing of mortar joints is not permitted.

E. Keep cavity airspace and weep holes clean of mortar. Clean out promptly if mortar falls into cavity airspace or plugs weep holes.

F. In-Progress Cleaning:

1. Remove excess mortar.
2. Dry brush exposed masonry prior to the end of each workday.
3. Protect wall from mud splatter and mortar droppings.
    a. Set scaffolds and scaffold boards so that mortar is not deflected onto masonry.
    b. At the end of each workday, turn scaffold boards so that rainwater is not deflected onto masonry.
4. Place concrete masonry units such that mortar does not run down the face of the wall or smear the masonry face.

G. Adjustments:

1. Do not shift or tap concrete masonry units after mortar has taken initial set.
2. If adjustment is required, remove unit and mortar in its entirety and replace.

H. After joints are tooled, cut off mortar tailings with trowel and dry brush excess mortar burrs and dust from the face of the masonry.

I. Fully bond interior and exterior corners and properly anchor intersecting walls.

3.5 JOINTS

A. Horizontal and vertical joints at masonry units shall be as specified herein and concrete unit masonry joints shall be 3/8-inch wide and as follows:

1. Point joint tight in masonry below ground.
2. All end joints shall be fully filled with mortar and joints squeezed tight. Slushing of mortar into joints shall not be permitted. Mortar in bed joints shall be held back approximately 1/2 inch from cell to provide positive bond with grout.

3. Exposed Joints:
    a. At all interior exposed surfaces of concrete masonry units, vertical and horizontal joints shall be concave, unless noted otherwise.
    b. At all exterior surfaces of concrete masonry units, vertical and horizontal joints shall be concave, unless noted otherwise.
    c. At all exterior and interior surfaces to receive adhered, surface applied coverings/finishes, vertical and horizontal joints shall be flush.
4. Tool vertical joints first.
5. Concave joints shall be formed by striking the mortar flush, and after partial set tooled with a tool of sufficient length to provide a uniform joint, free of waves. Tool shall be of a diameter to provide a joint that is as close to flush as possible. Use tool with large enough radius that joint is not raked free of mortar.

3.6 MASONRY REINFORCEMENT

A. Place reinforcement in accordance with ACI 315, to the tolerance specified in Drawings.

B. Reinforcing steel shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the plans shall not be used. Heating of bars for bending will not be permitted.
    1. Bars shall conform accurately to the sizes, shapes, lines and dimensions shown on Drawings and with hooks and bends made as detailed. Bars shall be placed as indicated on Drawings and centered on grout space.
    2. At the time grout is placed around it, reinforcing steel shall be clean of mill scale or other coatings that will destroy or reduce bond.
    3. All vertical reinforcing steel shall be installed in one piece, full height of wall, and braced throughout its height in a manner that will retain the steel in proper position and provide the proper clearance.

3.7 GROUTING

A. General Requirements:
    1. All cells shall be grouted solid.
    2. Use grout pump, hopper or bucket to place grout.
    3. Place grout in final position within 1-1/2 hours after introduction of mixing water.
        a. Place grout and rod with a 3/4-inch flexible cable vibrator sufficiently to cause it to flow into all voids between the cells and around the reinforcing steel. Slushing with mortar will not be permitted.
        b. Do not insert vibrators into lower pours that are in a semi-solidified state.
    4. Stop grout approximately 1-1/2 inches below top of last course; except at top course bring grout to top of wall. Where bond beams occur, stop grout pour a minimum of 1/2 inch below the top of the masonry.
    5. Prior to grouting, the grout space shall be cleaned so that all spaces to be filled with grout do not contain mortar projections greater than 1/2 inch, mortar droppings or other foreign material.
    6. The grouting of any section of wall shall be completed in one day with no interruptions greater than one hour.

B. High-Lift Grouting:

1. Due to the anticipated congestion of conduits, pipes, reinforcing bars, etc., hollow metal framed openings with security requirements for fully grouted frames, concerns of full grout consolidation below window openings, and increased risk of frame movement during grouting, low-lift grouting shall be employed.
2. For bidding purposes, high-lift grouting shall not be anticipated. High-lift grouting may be considered at select locations only when specifically reviewed and accepted by Architect.
3. Where select wall areas are accepted to utilize high-lift grouting, the method shall be acceptable to the Architect and the Authority Having Jurisdiction.
    a. Maximum grout pour height, comprised of multiple 5 feet-4 inch maximum grout lifts:
        1) 12 feet-8 inches for 8 inch wide and 12 inch wide insulated CMU.
        2) 24 feet-0 inches for 12 inch wide CMU.
4. Cleanouts are required when high-lift grouting method is used. Cleanouts shall be provided in the bottom course at every vertical rebar. Cleanouts shall be located on concealed faces of wall and shall be sealed after inspection and before grouting. Cleanouts will not be allowed on exposed faces of wall.

C. Low-Lift Grouting:

1. Units shall be laid to a maximum height of five feet-four inches before grouting, and all over-hanging mortar and mortar droppings shall be removed.
2. Grouting shall follow each five feet-four inches height of construction laid, and shall be consolidated so as to completely fill all voids and embed all reinforcing steel.

3.8 CONTROL JOINTS

A. Install control joints in continuous lengths as shown on Drawings.

B. Size joints in accordance with manufacturer's recommendations for sealant performance.

C. Install backer rod and sealant under provisions of Section 07 92 00.

D. Install preformed control joint filler at locations indicated on drawings.

E. Use proper size material to create sealant joint specs.

3.9 EXPANSION JOINTS

A. Install expansion joint filler material on centerline of wall at locations indicated on Drawings.

B. Install backer rod and sealant under provisions of Section 07 92 00.

3.10 BOND BEAMS

A. Bond beams shall be located where shown and detailed on Drawings, and shall be reinforced as indicated and as hereinafter specified.

3.11 BUILT-IN WORK

A. Miscellaneous Embedded Items: All items indicated to be embedded in masonry shall be carefully located and anchored to prevent movement during grouting operations. Avoid cutting and patching.

1. Install all anchor bolts and anchors furnished under other Sections.

B. Pipes and Conduits: Horizontal and vertical pipes and conduits embedded in walls shall not exceed the limitations indicated on the Structural Drawings.

3.12 PRECAST CONCRETE CAPS

A. Set units in full bed of mortar with full head joints, unless otherwise indicated.

B. Set units with joints 1/4 inch wide unless otherwise indicated.

C. Build anchors and ties into mortar joints as units are set.

3.13 CUTTING AND FITTING

A. Cutting: Make all unit cuts, including those for bonding, holes, boxes, etc., with motor-driven masonry saws, using either an abrasive or diamond blade. Cut neatly and locate for best appearance. Cut with proper tools to provide straight, unchipped edges and take care to prevent raking masonry unit corners or edges.

B. Cut and fit for weep hole pipes and miscellaneous penetrations. Cooperate with other sections' work to provide correct size, shape and location.

C. Obtain approval prior to cutting or fitting any area not indicated or where appearance or strength of masonry work may be impaired.

3.14 REPAIR, POINTING AND CLEANING

A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units.

B. Pointing: During the tooling of joints, enlarge any voids or holes and completely fill with mortar.

C. Dry brush masonry surface after mortar has set, at end of each day's work and after final pointing.

D. Leave work and surrounding surface clean and free of mortar spots and droppings.

E. Cleaning:

1. Keep walls clean daily during installation using brushes, rags, and burlap squares. Do not allow excess mortar lumps or smears to harden on the finished surfaces. Remove green mortar with burlap or a dry cloth.

2. Upon completion of masonry installation, repair all holes. Mortar joints that are not properly tooled or that show cracks shall be cut out, removed, and repointed at no cost to the Owner.

F. Final Cleaning:

1. Just prior to project substantial completion, and prior to the application of water repellent/anti-graffiti coating, clean masonry surfaces.
    a. Cleaning Product: PROSOCO Sure Klean line of cleaners, product appropriate to installed concrete units, or accepted equal.
        1) Run-off from cleaning operations shall be contained, neutralized, and disposed of per State and local regulations. Obtain necessary permits for disposal of run-off.
    b. Sandblasting is an acceptable alternative means of cleaning, provided that no silica particulates are used.
        1) Sandblasting operations shall not generate large quantities of dust. Employ wet sandblasting methods to control dust.
2. Final cleaning and water repellent/anti-graffiti coating application shall not be scheduled until walls have thoroughly dried out and sealants have been installed and cured.

3.15 FIELD QUALITY CONTROL

A. Owner's Inspector and/or Testing Agency will:

1. Provide the following checks as a minimum:
    a. Measurement and mixing of field mixed mortar and grout.
    b. Moisture conditions of masonry units at time of laying.
    c. Inspection of laying of units with special attention to joints and bonding of units at corners.
    d. Proper placement of reinforcement including splices, clearances and supports.
    e. Observation of placement of pipes, conduits, or other weakening elements.
    f. Inspection of grout spaces immediately prior to grouting for removal of mortar fins, dirt and debris.
    g. Continuous inspection of grout placement with attention to procedures to avoid segregation and achieve proper consolidation.
    h. Perform or supervise sampling for testing.

B. Contractor shall be responsible for repair of any damage to work caused by testing.

C. Contractor shall pay Owner's Testing Agency for all additional testing required, including masonry cores, when laboratory tests of specimens show compressive strengths below specified minimum and judged to be inadequate by Architect.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural steel framing and support members.

B. Base plates and bearing plates.

C. Grouting under base plates.

1.2 RELATED SECTIONS

A. Section 03 20 00 – Concrete Reinforcing.

B. Section 03 30 00 – Cast-In-Place Concrete.

C. Section 05 31 00 – Steel Decking.

D. Section 05 40 00 – Cold-Formed Metal Framing.

E. Section 07 81 16 – Cementitious Fireproofing.

F. Section 09 91 00 – Painting: Paint finish.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. AISC 303-16 – Code of Standard Practice for Steel Buildings and Bridges.
2. ANSI B18.22.1 – Plain Washers.
3. ANSI B18.23.1 – Beveled Washers.
4. ASTM A6/A6M – Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
5. ASTM A36/A36M – Standard Specification for Carbon Structural Steel.
6. ASTM A53/A53M – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
7. ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
8. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

9. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
10. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
11. ASTM A563 – Standard Specification for Carbon and Alloy Steel Nuts.
12. ASTM A572/A572M – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
13. ASTM A780/A780M – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
14. ASTM A992 – Standard Specification for Structural Steel Shapes.
15. ASTM F436 – Standard Specification for Hardened Steel Washers.
16. ASTM F844 – Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.
17. ASTM F959 – Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
18. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
19. ASTM F3125 - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat-Treated, 120/150 ksi Minimum Tensile Strength.
20. AWS A2.4 – Standard Symbols for Welding, Brazing, and Nondestructive Examination.
21. AWS D1.1 – Structural Welding Code – Steel.
22. AWS D1.4 – Structural Welding Code – Reinforcing Steel.
23. AWS D1.8 – Structural Welding Code – Seismic Supplement.
24. AWS D2.0 – Specifications for Welded Highway and Railway Bridges.
25. RCSC – Specification for Structural Joints Using High Strength Bolts.
26. SSPC – Steel Structures Painting Manual, Volumes 1 and 2.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings:

1. Indicate profiles, sizes, spacing, and locations of structural members, attachments, fasteners, and required connections, including connections not detailed on Drawings.
2. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
3. Clearly distinguish between shop and field bolts and welds.

C. Manufacturer's Mill Certificate: Submit Manufacturer's Certificates under provisions of Division 01, certifying that steel, fasteners and welding electrodes meet or exceed specified requirements.

D. Mill Test Reports: Submit Manufacturer's Reports under provisions of Division 01, indicating structural strength, destructive and non-destructive test analysis and ladle analysis.

E. Submit product data for type of metal primer proposed for use.

F. Welders' Certificates: Submit certificates under provisions of Division 01, certifying welders employed on the Work, verifying AWS qualifications within the previous twelve months.

1. Welders who have not performed welding for period of three or more months shall be requalified.
2. Welders whose work fails to pass inspection shall be requalified before performing further welding.
3. Contractor shall pay costs of certifying qualifications.

G. Welding Procedures: Submit proposed Welding Procedure Specifications (WPS). Where WPS is not prequalified by AWS D1.1, submit supporting Performance Qualification Records (PQR).

H. Qualification Data: For qualified Fabricator and Installer.

1.5 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, Code of Standard Practice for Steel Buildings and Bridges.

B. Seismic-Force-Resisting System: Elements of structural-steel frame designated as "SFRS" or along grid lines designated as "SFRS" on Drawings, including columns, beams, and braces and their connection.

1.6 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with the AISC Specification for Structural Steel Buildings, Code of Standard Practice for Steel Buildings and Bridges and Quality Criteria and Inspection Standards.

B. Fabricator Qualifications: Company specializing in performing the work of this Section with sufficient documented experience.

C. Installer (Erector) Qualifications: Company specializing in performing the work of this Section.

1.7 REGULATORY REQUIREMENTS

A. Conform to 2022 California Building Code (CBC), Chapter 16 “Structural Design”, Chapter 22 “Steel", and Chapter 17 “Special Inspections and Tests”.

B. Structural Tests and Inspections: Refer to project Enforcement Agency Structural Tests and Inspection Sheet.

C. Materials:

1. Material identification per CBC Chapter 22, Section 2202.1.
2. Protection of structural steel per CBC Chapter 22, Section 2203.1.

1.8 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on shop drawings.

B. Coordinate fabrication and delivery of structural steel items with concrete work and with all other trades to permit such items to be built into the structure without delay.

1.9 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials to be Installed Under Other Sections: Anchor bolts and other anchorage devices which are embedded in cast-in-place concrete construction shall be delivered to the project site in time to be installed before start of cast-in-place concrete operations.

B. Storage of Materials:

1. Structural steel members to be stored at the Project site shall be placed above ground, on platforms, skids or other supports.
2. Steel shall be protected from corrosion.
3. Other materials shall be stored in a watertight, dry place until ready for installation in the Work.
4. Packaged materials shall be stored in their original package or container.
5. Do not store materials on the structure in a manner that might cause distortion or damage to members of supporting structures. Repair or replace damaged materials or structure as directed by Architect.

PART 2 PRODUCTS

2.1 MATERIALS

A. Structural Steel Members:

1. ASTM A992 Grade 50 for wide flange and WT shapes.
2. ASTM A36/A36M or A572 Grade 50 for plates, as noted on Drawings.
3. ASTM A36/A36M for channels, angles and all other shapes.

B. HSS:

1. Tubing: ASTM A500, Grade C.
2. Round: ASTM A500, Grade C.

C. Pipe: ASTM A53/A53M, Type E or S, Grade B.

D. Bolts and Nuts: ASTM A307, Grade A, with ASTM A563, Grade A, hex nuts; ASTM F3125, Grade A325N, Type 1, with ASTM A563, Grade C, heavy hex nuts; anchor bolts, ASTM F1554, grade as indicated on Drawings.

E. High-Strength Bolts, Nuts, and Washers: ASTM F3125, Type 1, heavy hex steel structural bolts; ASTM A563 heavy hex carbon-steel nuts.

F. High-Strength Bolts, Nuts, and Washers: ASTM F3125, Type 1, heavy hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers, plain.

G. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125, Type 1, heavy hex head or round head steel structural bolts with splined ends; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers.

H. Welding Materials:

1. Typical Weld Locations: AWS D1.1; type required for materials being welded.
2. SFRS and Demand Critical Welds: AWS D1.8; filler metal shall be classified as low hydrogen and shall have a minimum Charpy V-notch toughness of twenty foot-pounds at 0 degrees F for SFRS welds and forty foot-pounds at 70 degrees F for Demand Critical Welds as determined by AWS classification or manufacturer certification. Demand critical weld material shall also meet heat input testing requirements of AWS D1.8, Clause 6.3.

I. Circular washers for common bolts: ASTM F844, Type A, and ANSI B18.22.1.

J. Beveled washers for common bolts: ANSI B18.23.1.

K. Washers for high strength bolts: Direct tension indicator. ASTM F959 hardened circular, beveled and clipped, ASTM F436.

L. Post-Installed Concrete Anchors: ICC approved, as indicated and manufactured by Hilti or accepted equal.

M. Eye Bolts and Nuts: ASTM A108, Grade 1030, cold-finished carbon steel.

N. Sleeve Nuts: ASTM A108, Grade 1018, cold-finished carbon steel.

O. Welded Headed Stud Anchors: ASTM A108. Welding, testing and inspection shall be in accordance with AWS D1.1.

P. Steel Shop and Touch-Up Primer: TNEMEC Series 115 Uni-Bond DF or accepted equal.

Q. Shop and Touch-Up Zinc Rich Primer for Galvanized Surfaces: ZRC Galvilite Galvanizing Repair Compound as manufactured by ZRC Worldwide Company, Phone: (800) 831-3275, or accepted equal.

R. Weld filler material: All weld filler material shall have a minimum tensile strength of 70 KSI per AWS D1.1, latest edition approved by code enforcement agency.

S. Drypack: Refer to Section 03 30 00.

T. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 28 days.

U. Reinforcing Steel: Refer to Section 03 20 00.

2.2 FABRICATION

A. General: Fabricate items of structural steel in accordance with AISC specifications and as indicated on Drawings. Properly mark and match-mark all materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling.

1. Welded splicing of structural members may be done only upon written acceptance by Architect, unless otherwise indicated on Drawings. Splicing shall be thoroughly examined by a nondestructive means at Contractor's expense. Inspection shall be made by a recognized and approved testing laboratory; procedure, technique and standards of acceptance shall conform to Appendix E of AWS Standard D2.0-69. Correct faulty welds and re-examine in a manner specified for original welds.

B. Welded Construction:

1. Weld in accordance with AISC using manual shielded arc method or flux cored arc method in accordance with AWS D1.1 and AWS D1.8. Groove welds shall be complete joint penetration welds, unless specifically designated otherwise on Drawings.
2. Remove back-up plates for complete joint penetration welds when specifically requested by testing laboratory to perform non-destructive testing. Remove at no cost to Owner.
3. Weld reinforcing steel in accordance with AWS D1.4 and using prequalified procedures.

C. Connections:

1. Weld or bolt shop connections as indicated.
2. Bolt field connections except where welded or other connections are indicated. Provide unfinished threaded fasteners only where noted on Drawings and for temporary bracing to facilitate erections.

D. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for the passage of work through steel framing members as indicated. Provide threaded nuts welded to framing, and other specialty items as shown to receive other work. Cut, drill or punch holes perpendicular to metal surfaces. Thermally cut holes are only permitted at anchor rod holes.

2.3 FINISHES

A. Prepare structural component surfaces in accordance with SSPC SP-2 at concealed locations and SSPC SP-6 at exposed locations. Provide Class “A” (clean mill scale) contact surfaces per RCSC 2016 at high-strength bolted connections.

B. Do not prime surfaces scheduled to receive cementitious fireproofing, in direct contact with concrete, where field welding is required, or contact surfaces of steel-to-steel connections. Provide Class “A” or better contact surfaces at steel connections per RCSC Specification for Structural Joints Using High Strength Bolts, latest edition.

C. All exposed interior steel shall be primed with shop primer unless otherwise noted.

1. Primer shall be applied in one coat, to meet or exceed the minimum mil thickness required by the primer manufacturer.

D. All un-exposed, concealed or enclosed interior or exterior steel requires no finish.

E. All exposed exterior steel shall be galvanized unless otherwise noted.

1. Galvanize in accordance with ASTM A123/A123M, designated steel items. Provide minimum 1.25 ounce per square foot galvanized coating.
2. At galvanized members, touch-up all welds with zinc-rich primer.

F. Column Bases: Column bases and base plates shall be finished in accordance with the following requirements:

1. Steel bearing plates 2 inches or less in thickness are permitted without milling provided a smooth and notch-free contact bearing surface is obtained. Steel bearing plates over 2 inches but not over 4 inches in thickness are permitted to be straightened by pressing or, if presses are not available, by milling for bearing surfaces, except as stipulated in subparagraphs (2) and (3) below, to obtain a smooth and notch-free contact bearing surface. Steel bearing plates over 4 inches in thickness shall be milled for bearing surfaces, except as stipulated in subparagraphs (2) and (3) below.

2. Bottom surfaces of bearing plates and column bases that are grouted to ensure full bearing contact on foundations need not be milled.
3. Top surfaces of bearing plates need not be milled when complete-joint-penetration groove welds are provided between the column and the bearing plate.

2.4 TESTING AND INSPECTION

A. General: Owner will engage and pay a testing agency to perform the following services:
1. Review manufacturer's certificates and check heat numbers and that the steel is properly identified in accordance with CBC Section 2202 “Identification of Steel for Structural Purposes”.
2. Testing of unidentified materials or as directed by Owner.
3. Provide inspection per CBC Sections 1705.2 and 1705.13.
4. Provide testing per CBC Section 1705.14.
5. In the event an examination discloses faulty welds and additional tests are required to fully examine the welds, the cost of the additional tests shall be paid for by Owner and back-charged to Contractor.
6. All defective welds shall be repaired and tested at no expense to Owner.
7. Perform any physical tests of structural steel as required by Architect. Perform ultrasonic tests on members as determined by Architect to determine if delamination defects in steel members are evident.
8. High-strength bolting testing and inspection shall conform to the following requirements:
a. Perform pre-installation verification of pretensioned bolts per RCSC Section 7.1 for the selected pretensioning method.
b. Inspect bolted joints per RCSC Section 9 and CBC Section 1705.2.1.
c. All fasteners failing to meet the specified tension shall be examined to determine the cause of failure and re-tested.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation means erector accepts existing conditions.

C. Bolts shall be clean and free of grease, oil and all other deleterious substances.

3.2 ERECTION

A. Allow for erection loads and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of permanent bracing.

B. Field weld components indicated on shop drawings.

C. Do not field cut or alter structural members without acceptance of Architect.

D. After erection, prime welds, abrasions and surfaces not shop primed, except surfaces to be in contact with concrete.

E. Setting Base Plates:

1. Clean concrete bearing surfaces and roughen to improve bond. Clean the bottom surface of base plates.
2. Set loose and attached base plates for structural members on adjusting nuts at anchor bolts. All anchor bolts shall have double nuts for adjusting.
3. Tighten anchor bolts after the supported members have been positioned and plumbed. Do not remove adjusting nuts.
4. Place non-shrink grout solidly between surfaces as shown to ensure that no voids remain. Finish exposed surfaces, protect installed materials and allow non-shrink grout to cure.

F. Structural steel work shall be set accurately at established lines and levels. Steel shall be plumb and level before final bolting or welding is commenced and after complete erection. All cutting, notching, coping, etc., required for proper assembly and fitting of parts and members, shall be done by the steel fabricator. Such workmanship shall be equal in quality to shop work.

1. Coordinate the erection of structural steel with other trades and locate temporary guys, braces, falsework and cribbing as may be necessary for erection so as not to interfere with the progress of other work.
2. Rolled sections, except for minor details, shall not be heated except for welding operations.
3. Upon acceptance by Architect, gas cutting may be permitted if the metal being cut is not highly stressed during the operation. Stresses shall not be transmitted through a flame cut surface unless such surfaces are cut by a mechanically guided torch. The radius of re-entrant flame cut fillets shall be as large as possible, but not less than 1 inch. To determine the net area of members so cut, 1/8 inch shall be deducted from the flame cut edges not made by a mechanically guided torch. Gas cuts shall be smooth and regular. Holes for bolts shall not be cut with a torch.
4. All contact surfaces shall be cleaned before assembly.
5. Provide setting diagrams and templates as required. Placement of beam connectors shall be the responsibility of structural steel fabricator.
6. Splice members only where indicated.

G. Connections shall be as specified hereinbefore under "Fabrication." In addition, bolted connections shall conform to the following requirements:

1. Beveled washers shall be used under all bolt heads and nuts where they rest on beveled surfaces.
2. Connectors shall have hexagon heads and nuts.
3. Nuts shall be drawn up tight. Check threads of unfinished bolts with chisel or approved self-locking nuts.
4. Bolts that have been completely tightened shall be marked with identifying symbol.
5. High-strength bolted construction: Install high-strength threaded fasteners in accordance with RCSC Specification for Structural Joints Using High-Strength Bolts. All high strength bolts shall be pretensioned, unless specifically noted otherwise. Pretensioning shall be by one of the methods permitted in RCSC Section 8.2.

H. Framing shall be carried up true and plumb. Temporary bracing shall be introduced wherever necessary to take care of all loads to which structure may be subjected, including erection equipment and its operation. Such bracing shall be left in place as long as may be required for safety. It shall finally be removed by Contractor as part of his equipment. As erection progresses, the work shall be securely connected to take care of all dead load, lateral loads and erection stresses. No final bolting or welding shall be done until the structure has been properly aligned.

3.3 ERECTION TOLERANCES

A. Level and plumb steel within the tolerances defined in the AISC Code of Standard Practice, latest edition.

3.4 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint as specified or according to ASTM A780, and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or re-prime field connections, rust spots, abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

3.5 CLEAN-UP

A. Upon completion of the work of this Section, remove all surplus materials, rubbish and debris from premises.

END OF SECTION

SECTION 05 31 00

STEEL DECKING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel decking and accessories:

B. Framing for openings up to and including 24 inches.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 05 12 00 – Structural Steel Framing.

C. Section 07 81 16 – Cementitious Fireproofing.

D. Section 09 91 00 – Painting: Paint finish.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. AISI S100 – North American Specification for the Design of Cold-Formed Steel Structural Steel Members.
2. ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
3. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. ASTM E329 – Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
5. AWS D1.1 – Structural Welding Code – Steel.
6. AWS D1.3 – Standard Welding Code – Sheet Steel.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Indicate decking plan, dimensions, sizes, support locations, projections, openings and reinforcement, pertinent anchoring details and accessories. Coordinate with other trades in accurately locating and detailing openings and penetrations.

C. Product Data: Provide deck profile characteristics and dimensions, structural properties, finishes and accessories.

D. Manufacturer's Installation Instructions: Indicate specific installation sequence and special instructions.

E. Certificates:

1. The manufacturer's certification and fire test reports to document that deck assemblies comply with requirements of this Section.
2. Furnish certification by approved testing agency for each welder employed.

1.5 PERFORMANCE REQUIREMENTS

A. Steel decking and section properties shall comply with AISI S100.

B. Profile and design of deck units and accessories shall conform to the details shown on Drawings. Units shall be one piece, unless indicated otherwise.

C. Steel decking and its installation shall meet the requirements of 2022 California Building Code (CBC).

1.6 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on shop drawings.

1.7 TESTS AND INSPECTIONS

A. Furnish test specimens of materials when they are requested. Welded decking in place is subject to inspection and testing per CBC Chapter 17 “Special Inspections and Tests”, Section 1705 “Required Special Inspections and Tests”.

1. Expense of removing and replacing any portion of decking for testing purposes will be borne by Owner if installation is found to be satisfactory. All portions of the work found to be defective and not in conformity with contract requirements shall be removed and replaced at no cost to Owner.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM E329 for testing indicated.

B. Welding: Qualify procedures and personnel according to AWS D1.3.

C. Installer: Company specializing in performing work of this Section.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Store and protect products under provisions of Division 01.

C. Store decking on dry wood sleepers; slope for positive drainage. Work showing creases, burrs in cells, deformation, weathering, or other defects affecting its use or appearance in exposed locations will not be accepted.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:

1. Basis-of-Design: ASC Steel Deck, West Sacramento, CA; 916-372-6851, www.ascsd.com; per evaluation agency reports as follows:

a. IAPMO Evaluation Report No. ER-0161 for bare steel deck.

b. IAPMO Evaluation Report No. ER-0329 for concrete-filled steel deck.

B. Substitutions: Under provisions of Division 01 with valid Evaluation Agency Report.

1. Substitution requests for steel decking shall consider the vertical and lateral load capacities of final system, including attachments. Provide a comparison summary of proposed and specified deck systems showing that the proposed system has equal or greater vertical and lateral load capacities for all conditions shown on Drawings. Systems with lower load capacities will not be acceptable.

2. Substitution requests will require review by the Structural Engineer of Record and Authority Having Jurisdiction (AHJ). Cost for such reviews shall be borne by Contractor.

3. Do not submit shop drawings with substituted decking manufacturer until decking manufacturer has been accepted via substitution request process.

2.2 MATERIALS

A. Sheet Steel for Bare Deck: ASTM A653/A653M, SS designation, Grade 40 (minimum yield 38 KSI); zinc coated conforming to ASTM A653/A653M, G60, unless noted otherwise. Refer to Drawings for types and sizes of steel decking.

B. Sheet Steel for N Deck: ASTM A653/A653M, SS designation, Grade 50 (minimum yield 50 KSI); zinc coated conforming to ASTM A653/A653M, G60, unless noted otherwise. Refer to Drawings for types and sizes of steel decking.

C. Sheet Steel for Composite Deck: ASTM A653/A653M, SS designation, Grade 50 (minimum yield 50 KSI); zinc coated conforming to ASTM A653/A653M, G60, unless noted otherwise. Refer to Drawings for types and sizes of steel decking.

D. Welding Materials: Conform to AWS D1.1 and D1.3, with a minimum 60 KSI filler metal yield strength.

E. Shop and Touch-Up Zinc Rich Primer for Galvanized Surfaces: ZRC Galvilite Galvanizing Repair Compound as manufactured by ZRC Worldwide Company, Marshfield, MA; 800-831-3275, www.zrcworldwide.com, or accepted equal.

F. Steel Decking and Design: Steel decking shall be metallic coated with interlocking side lap. Deck types and minimum structural properties shall be as indicated on Drawings. Submit Evaluation Agency Reports that demonstrate compliance with design requirements.

1. Decking shall be vented with factory punched holes where filled with concrete; otherwise provide non-vented decking. Venting is not required at concrete filled deck where underside is permanently exposed or where cellular deck is used.

G. Welded Headed Studs: ASTM A108. Welding testing and inspection shall be in accordance with AWS D1.1 and CBC Sections 1705.2.2, 1705.13 and 1705.14.

H. Insulation at Acoustical Decking: Unfaced fiberglass batts provided and installed by decking manufacturer, cut to size for profile of decking.

2.3 FABRICATION

A. Fabrication: All steel decking units shall be roll-formed to assure uniformity and strength.

B. Allowable Tolerances: Maximum variation in unit alignment 1/4 inch in 40 feet (1/1920).

C. Workmanship: All work shall be neat, trim, true to line and upon completion shall present a true finished surface of specified deck profile, free of dents, deformations, creases, weld spatter or other noticeable defects. Steel deck permanently exposed to view shall be manufactured, handled, and transported for “exposed” installation.

D. Reinforcement: Provide reinforcement for openings, cutouts and free edges of decking as required for strength and stiffness. Provide reinforcement where a cell is cut parallel to rib as necessary to make a tight fit along the cut cell. Such reinforcement shall be in addition to structural supports shown on Drawings and specified in Section 05 12 00.

E. Miscellaneous Work: Provide all other transition pieces, reinforcement and miscellaneous decking items as detailed and required to provide a complete installation.

F. Where steel decking is scheduled to receive fireproofing or a paint finish, it shall be provided free of lubricants, oils, passivators, and other substances which would impair the adhesion of the fireproofing or paint system.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work. Check supporting members for correct layout and alignment. Should layout and alignment be such as to prevent proper bearing of the deck units on supporting members, the deck installer shall bring it to the attention of structural steel installer in writing, with a copy to Architect, for corrective measures and action. Steel decking units shall not be placed until necessary corrections are made.

B. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

A. Erect steel decking in accordance with Evaluation Agency Report, manufacturer's instructions and final shop drawings.

B. Placing and Fastening Deck Units: Place decking in a permanent position with all panels aligned end-to-end so that the fluted portions of the panels align accurately. Panels shall be placed on supporting framework and adjusted in final position before being permanently fastened. Ends shall be over structural supports with positive, complete bearing over full width of panels. Installation shall be accomplished without deformation of units. Decking layout shall be as indicated on Drawings.

1. Carefully check control points, as indicated, for layout of deck flutes. Where required, deck module shall be adjusted to conform to layout indicated.
2. Fasten deck units to structure and to each other as indicated.

3. At galvanized steel decks, deslag, clean, and touch-up all welds with zinc-rich primer, including those at the underside of deck.
    a. Exception: Do not touch-up welds on top of deck which will be covered with concrete.
4. Complete installation shall conform to manufacturer's specifications and as detailed.

C. Openings Through Decking: Steel decking fabricator shall cut and reinforce all openings in the metal deck, including framed openings indicated on Drawings. Small miscellaneous openings shall be field-cut by the trade requiring the opening.
1. All cutting of exposed edges shall be square, trim and equal to factory cutting.
2. Steel deck panels and accessories shall be cut and neatly fit around openings and other work projecting through the deck.
3. Openings shall be reinforced as indicated or required to provide a rigid installation.

D. Steel decking installation shall proceed in accordance with current Cal/OSHA and OSHA regulations including guidelines with respect to fall protection.

E. Steel decking shall be spread for safety and working platforms.

F. All steel decking sheets shall be wind tacked and loose bundles of deck shall be wired at the end of each shift.

G. Provide a membrane barrier between steel deck and preservative treated or fire retardant treated wood.

H. Concrete Filled Deck Installation:
1. Provide deck accessories required to contain concrete during concrete placement.
2. Concrete fill thicknesses over steel deck indicated on the construction documents are minimum thicknesses. Provide additional concrete fill as required to compensate for framing or deck deflections during placement in order to maintain specified surface tolerances and minimum thicknesses.
3. Place concrete in a manner to avoid excessive deflections or ponding.
4. Place concrete fill on adjacent spans before placement on cantilever conditions.
5. Provide shoring where indicated on Drawings and where deck span exceeds manufacturer’s listed maximum unshored span. Do not remove forms until concrete fill has reached its minimum compressive strength.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field welds will be subject to inspection.

C. Remove and replace work that does not comply with specified requirements.
1. Additional inspection, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.4 PROTECTION

A. Do not use steel decking for storage or working platforms until it has been permanently fastened. Storage loads must be supported on wood blocking in the flutes of the deck.

1. Any damaged deck unit shall be repaired or replaced as directed by Architect and at no cost to Owner.

B. Assure that construction loads do not exceed the carrying capacity of the deck.

3.5 CLEAN-UP

A. Upon completion of the work of this Section, remove all surplus materials, rubbish and debris from premises.

END OF SECTION

SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel stud exterior wall framing.

B. Exterior soffit joist framing.

1.2 RELATED SECTIONS

A. Section 05 12 00 – Structural Steel Framing.

B. Section 05 31 00 – Steel Decking.

C. Section 07 21 00 – Thermal Insulation.

D. Section 07 92 00 – Joint Sealants.

E. Section 09 22 16 – Non-Structural Metal Framing.

F. Section 09 29 00 – Gypsum Board.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. AISI S100 – North American Specification for the Design of Cold-Formed Steel Structural Steel Members.
2. AISI S202 – Code of Standard Practice for Cold-Formed Steel Structural Framing.
3. AISI S400 – North American Standard for Seismic Design of Cold-Formed Steel Structural Systems.
4. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.
5. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
6. ASTM A1003/ A1003M – Standard Specification for Steel Sheet, Carbon, Metallic and Nonmetallic-Coated for Cold-Formed Framing Members.
7. ASTM C645 – Standard Specification for Nonstructural Steel Framing Members.

8. ASTM C754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
9. ASTM C1007 – Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
10. ASTM C1513 – Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
11. AWS D1.1 – Structural Welding Code – Steel.
12. AWS D1.3 – Structural Welding Code – Sheet Steel.
13. SFIA – Steel Framing Industry Association.
14. SSMA – Steel Stud Manufacturers Association.
15. SSPC – Steel Structures Painting Manual.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria and limitations.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

D. Evaluation Reports: For products not covered in SSMA or SFIA standards, submit current evaluation reports reviewed per the applicable building code.

1.5 QUALITY ASSURANCE

A. Framing members shall be provided by a member of the Steel Stud Manufacturer’s Association (SSMA) or Steel Framing Industry Association (SFIA).

B. Calculate structural properties of framing members in accordance with American Iron and Steel Institute Cold-Formed Steel Design Manual AISI S100.

1.6 REGULATORY REQUIREMENTS

A. Conform to 2022 California Building Code (CBC), Chapter 16 “Structural Design”, Chapter 17 “Special Inspections and Tests”, and Chapter 22 “Steel", as applicable.

B. Materials:
1. Structural Steel per CBC Chapter 22.
2. Material Identification per CBC Chapter 22, Section 2202 “Identification of Steel for Structural Purposes”.

C. Inspection: CBC Chapter 17.
1. Welding Inspection per Chapter 17, Section 1705, Paragraph 1705.2 “Steel Construction”.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section.

B. Installer: Company specializing in performing the work of this Section.

1.8 COORDINATION

A. Coordinate work under provisions of Division 01.

B. Coordinate with the placement of components within the stud framing system, specified in Divisions 21-23 and 25-28.

PART 2 PRODUCTS

2.1 METAL FRAMING SYSTEM

A. Acceptable Manufacturers:
   1. ClarkDietrich Building Systems, West Chester, OH; 513-870-1100, www.clarkdietrich.com.
   2. Marino\WARE, South Plainfield, NJ; 800-627-4661, www.marinoware.com.
   3. CEMCO, Pittsburg, CA; 925-473-9340, www.cemcosteel.com.
   4. SCAFCO Steel Stud Company, Spokane, WA; 509-343-9000, www.scafco.com.

B. Substitutions: Under provisions of Division 01.

2.2 FRAMING MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, grade as follows:
   1. Grade: ST33H for 18 gauge and lighter, ST50H for 16 gauge and heavier as required by structural performance requirements.

B. Sheet Steel for Vertical Deflection and Drift Clips: ASTM A1003/A1003M and ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
   1. Grade: 50 (340).
   2. Coating: G90 (Z275).

C. Studs, Zees, Angles and Plates: ASTM A1003/A1003M Steel sheet formed to channel shape, solid web; sizes and gauges, as indicated on Drawings.

D. Deflection Track Slotted: Single, deep-leg, U-shaped steel track: punched with vertical slots in both legs. Steel Sheet top runner manufactured to prevent cracking of finishes applied to framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

E. Vertical Deflection Clips: Manufacturer’s standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web and capable of resisting forces imposed by the wall system.

F. Joists: ASTM A1003/ A1003M Grade 50, Class 1 or 2 sheet steel, formed to channel shape, punched web.

G. Headers and Jambs: Shapes used to form header beams and jambs, columns or posts, of web depths indicated, un-punched, with stiffened flanges.

H. Channel Bridging or Bracing: U-Channel Assembly: ASTM C645; Base metal thickness of 0.0538 inch, and minimum 1/2 inch wide flanges.

2.3 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered.

B. Plates, Gussets, Clips: Formed sheet steel, thickness as shown on Drawings.

C. Shop and Touch-Up Primer: TNEMEC Series 115 Uni-Bond DF or accepted equal, unless otherwise required to match shop primer.

D. Shop and Touch-Up Zinc Rich Primer for Galvanized Surfaces: ZRC Galvilite Galvanizing Repair Compound as manufactured by ZRC Worldwide Company, Marshfield, MA; 800-831-3275, www.zrcworldwide.com, or accepted equal.

2.4 FASTENERS

A. Self-drilling, Self-tapping Screws, Bolts, Nuts and Washers: ASTM C1513, corrosion resistant.

B. Welding: In conformance with AWS D1.1 and AWS D1.3.

C. Power Actuated Fasteners: Refer to Drawings. All fasteners shall have Evaluation Agency approval.

2.5 FINISHES

A. Framing Members and Connections:
   1. Provide galvanized finish per ASTM A653 as follows:
      a. Typical Locations: G-60.
      b. Elements Permanently Exposed to Un-conditioned Air: G-90.
   2. No equivalent coatings allowed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Division 01.

B. Verify that building framing components are ready to receive work.

3.2 ERECTION OF FRAMING

A. Install components in accordance with ASTM C754, ASTM C1007, AISI S202, manufacturer's instructions, and as shown on Drawings.

B. Align floor and top tracks; locate to wall layout. Secure in place by method shown on Drawings. Coordinate installation of sealant with floor tracks and studs attached to masonry walls.

C. Place studs as shown on Drawings. Connect studs to tracks using method shown on Drawings.

D. Construct corners using minimum three studs. Install double studs at wall openings and door and window jambs unless otherwise shown on Drawings.

E. Erect studs one piece full length. Splicing of studs is not permitted.

F. Erect studs; brace and reinforce to develop full strength to achieve design requirements.

G. Install intermediate studs above and below openings to align with wall stud spacing.

H. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

I. Attach furring channels to studs for attachment of fixtures anchored to walls.

J. Install framing between studs for attachment of mechanical and electrical items and to prevent stud rotation.

K. Touch-up field welds and damaged galvanized surfaces with primer.

L. Complete framing ready to receive exterior finish system.

1. Backing/Blocking: Shall be provided for all interior finishes and exterior finish systems, and for the supporting and anchorage of products, fixtures and equipment for all trades. Coordinate size, type, and location of backing and supports with manufacturer or supplier of items requiring backing/blocking.

3.3 ERECTION OF JOISTS

A. Install framing components in accordance with manufacturer's instructions.

B. Make provisions for erection stresses. Provide temporary alignment and bracing.

C. Place joists as shown on Drawings. Connect joists to supports as indicated on Drawings.

D. Set joists parallel and level, with lateral bracing and bridging.

E. Provide joist bridging at mid-point of spans or not to exceed 8 feet on center.

F. Touch-up field welds and damaged galvanized surfaces with primer.

G. Complete framing ready to receive finish.

3.4 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint as specified or according to ASTM A780, and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or re-prime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories and abutting steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

3.5 ERECTION TOLERANCES

A. Maximum Variation from True Position: 1/8 inch.

B. Maximum Variation of any Member from Plane: 1/8 inch.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal fabrications as follows:
   1. Railing assemblies.
   2. Bollards, metal.
   3. Downspouts.
   4. Woven security mesh.
   5. Roof access ladders.
   6. Miscellaneous metal fabrications.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 04 22 00 – Concrete Unit Masonry.

C. Section 09 91 00 – Painting.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:
   1. ANSI A14.3 – American National Standards for Fixed Ladders & Safety Requirements.
   2. ASTM A36/A36M – Standard Specification for Carbon Structural Steel.
   3. ASTM A53/A53M – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   4. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   5. ASTM A283/A283M – Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
   6. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
   7. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

8. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
9. ASTM B26/B26M – Standard Specification for Aluminum-Alloy Sand Castings.
10. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
11. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
12. ASTM B632/B632M – Standard Specification for Aluminum-Alloy Rolled Tread Plate. For aluminum.
13. ASTM D1187 – Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
14. ASTM E488 – Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
15. AWS A2.4 – Standard Symbols for Welding, Brazing, Nondestructive Examination.
16. AWS D1.1 – Structural Welding Code – Steel.
17. AWS D1.2 – Structural Welding Code – Aluminum.
18. AWS D1.3 – Structural Welding Code – Sheet Steel.
19. SSPC-Paint 20 – Zinc-Rich Coating, Type I-Inorganic and Type II-Organic.
20. SSPC-Paint 29 – Zinc Dust Sacrificial Primer, Performance-Based.
21. SSPC SP-2 – Hand Tool Cleaning.
22. SSPC SP-6 – Commercial Blast Cleaning.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: For each item specified, indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners and accessories. Include erection drawings, elevations and details where applicable.

C. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

D. Submit product data for type of metal primer proposed for use.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code – Steel."
   2. AWS D1.3, "Structural Welding Code – Sheet Steel."
   3. AWS D1.2, "Structural Welding Code – Aluminum."

B. Conform to 2022 California Building Code (CBC), Chapter 17 “Special Inspections and Tests” and Chapter 22 “Steel”.
   1. Materials:
      a. Material Identification per CBC Chapter 22, Section 2202 “Identification of Steel for Structural Purposes”.
   2. Inspection and Tests:
      a. Welding Inspection per CBC Chapter 17, Section 1705, Paragraph 1705.2 “Steel Construction”.
      b. Non-Destructive Weld Testing per CBC Chapter 17, Section 1705, Paragraph 1705.13.1 “Structural Steel”.

C. Painting: Refer to Section 09 91 00 for field painting.
   1. Do not paint galvanized surfaces that are indicated to remain galvanized.

1.6 QUALIFICATIONS

A. Welders' Certificates: Submit certificates under provisions of Division 01, certifying welders employed on the Work, verifying AWS qualification within the previous twelve months.

1.7 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.1 MATERIALS

A. Steel: Unless otherwise noted, provide steel materials as follows:
   1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
   2. Plates: ASTM A283/A283M.
   3. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, G90 (Z275) coating designation, structural quality.
   4. Pipe: ASTM A53/A53M, Type E or S, Grade B.
   5. HSS:
      a. Tubing: ASTM A500, Grade C.
      b. Round: ASTM A500, Grade C.
   6. Bolts, Nuts and Washers: ASTM A307.

B. Aluminum:
   1. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6, unless otherwise indicated.
   2. Aluminum Extrusions: ASTM B221, Alloy 6063-T6, unless otherwise indicated.
   3. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.
   4. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

C. Anchorage:

1. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
2. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.

D. Welding Materials:

1. Steel: AWS D1.1; type as required for materials being welded.
2. Sheet Steel: AWS D1.3; type as required for materials being welded.
3. Aluminum: AWS D1.2; type as required for materials being welded.

E. Weld filler material: All weld filler material shall have a minimum tensile strength of 70 ksi per AWS D1.1, latest edition approved by code enforcement agency.

F. Steel Shop and Touch-Up Primer: TNEMEC Series 115 Uni-Bond DF or accepted equal.

G. Shop and Touch-Up Zinc Rich Primer for Galvanized Surfaces: ZRC Galvilite Galvanizing Repair Compound as manufactured by ZRC Worldwide Company, Phone: (800) 831-3275, or accepted equal.

H. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

2.2 RAILING ASSEMBLIES

A. Steel Railing Assemblies: Fabricated from steel pipe, steel plates and sections; sizes and configurations as shown on Drawings.

1. Steel Pipe: ASTM A53/A53M, Grade A, Schedule 40.
2. Steel Plates and Shapes: ASTM A36/A36M.
3. Finish: Field painted in accordance with Section 09 91 00; color as selected by Architect.

B. Fabrication:

1. Railing gripping surfaces and any surfaces adjacent to them shall be free of sharp or abrasive elements and shall have rounded edges.
2. Railings shall not rotate in their fittings.

2.3 BOLLARDS, METAL

A. Pipe Bollard: ASTM A53/A53M; Schedule 40, Weight Class STD, steel pipe, galvanized.

1. Designator and Dimensions:
   a. NPS Designator: 3-1/2 inches NPS.
   b. Outside Diameter: 4 inches.
   c. Wall Thickness: 0.226 inch.
   d. Height and Embedment: As indicated on Drawings.
2. Fill fixed bollards with concrete. See Section 03 30 00 for concrete requirements.
   a. Bollards shall have 1/4-inch thick galvanized threaded steel cap.

B. Removable Bollards:

1. Bollards shall have 1/4-inch thick galvanized threaded steel cap.
2. Sleeves: Fabricate sleeves for removable bollards from Schedule 40 galvanized steel pipe or 1/4-inch wall-thickness galvanized steel pipe with 1/4-inch-thick galvanized steel plate welded to bottom of sleeve. Sleeves shall be depth indicated on Drawings and inside diameter shall be 1/4 inch maximum larger than outside diameter of bollard.
3. Provision for Padlock: Provide 1/2 inch diameter eye bolts welded to bollard and sleeve as indicated on Drawings.

C. Finish: Field paint in accordance with Section 09 91 00; color and pattern as selected by Architect.

2.4 DOWNSPOUTS

A. Downspouts and Support Brackets:

1. Pipe: ASTM A53/A53M, Schedule 40, round, galvanized, size as indicated on Drawings.
2. Support Brackets: Steel plates, sections, and sheets: galvanized; size and thickness as shown on Drawings.
3. Finish: Site paint finish under provisions of Section 09 91 00. Color as selected by Architect.

2.5 WOVEN SECURITY MESH

A. Sound Waves II by The Western Group or accepted equal, with the following characteristics:

1. Material: 10 gauge galvanized woven wire; crimp weave.
2. Weave Size: 1 inch square openings.
3. Percentage Open Area: 77.6 percent.
4. Mesh sheets shall span and lap between structural support members in longest lengths available for transporting.

2.6 ROOF ACCESS LADDERS

A. Access Ladders, General:

1. Regulatory Requirements: Conform to ANSI A14.3, OSHA, and UL requirements, as applicable.
2. Support each ladder at top and bottom, and not more than 48 inches on center, with brackets made from same metal as ladder.
3. Provide brackets and anchorage as indicated on Drawings.

B. Aluminum Ladders:

1. Acceptable Manufacturers:
   a. Basis-of-Design: O'Keeffe's, Inc., Brisbane, CA; 888-653-3333, www.okeeffes.com.
   b. Alaco Ladder Company, Chino, CA; 800-310-7040, www.alacoladder.com.
   c. Precision Ladders, LLC, Morristown, TN; 423-588-2265, www.precisionladders.com.
   d. Substitutions: Under provisions of Division 01.

2. Aluminum Parapet Access Ladders:
    a. Product: Model No. 503 aluminum parapet access ladder with platform and return.
    b. Materials:
        1) Side Rails: Continuous 6063-T5 aluminum extrusions, 3 inches x 1-3/4 inches x 1/8 inch, creating a tubular shape. Provide safety cap at top of each siderail.
        2) Rungs: 1-1/4 inch square 6061-T6 aluminum extrusion with serrated faces, rated for 1500 pounds.
            a) Fit rungs in centerline of side rails and attach rungs to side rails with two #12 x 1-1/4 inch stainless steel self-tapping screws each end.
        3) Brackets:
            a) Bottom, Intermediate, Top, and Return: 3/16 inch aluminum at 10 feet-0 inches on center maximum.
        4) Landing Platform: 1 inch x 3 inch x 1/8 inch 6063-T5 aluminum channel frame with 1-1/4 inch x 4-1/8 inch 6061-T6 aluminum serrated treads and serrated aluminum grab bars.
        5) Finish: Mill finish.
    c. Accessories:
        1) Ladder Guard.
            a) Manufacturer:
                (1) Garlock Safety Systems. Product: LadderGuard System, parapet wall installation.
                (2) Substitutions: Under provisions of Division 01.

C. Steel Ladders:
    1. Side Rails: Continuous, 3/8-by-3-1/2-inch steel flat bars, with eased edges, unless otherwise indicated.
    2. Rungs: 3/4-inch-diameter steel bars.
    3. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.
    4. Provide non-slip surfaces on top of each rung by coating with abrasive material metallically bonded to rung by a proprietary process. Provide one of the following products:
        a. W. S. Molnar Company; SlipNOT.
        b. IKG Industries, a Harsco company; Mebac.
    5. Prime interior ladders including brackets and fasteners, with zinc-rich primer.

2.7 MISCELLANEOUS METAL FABRICATIONS

A. Provide miscellaneous metal fabrications as required to complete work under other Sections, but not specified in those Sections.

B. Miscellaneous metal work, including, but not limited to, the following items:
    1. Steel Framing and Supports For:
        a. Steel support posts for plastic toilet partitions specified in Section 10 21 16.19.

b. Countertops.

c. Mechanical and electrical equipment.

2. Loose bearing and leveling plates.

3. Steel weld plates and angles for casting into concrete not specified in other Sections.

2.8 SHOP FABRICATION

A. Fit and shop assemble in largest practical sections, for delivery to site.

1. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Cut, drill, and punch metals cleanly and accurately. De-burr rough edges and holes.

E. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

F. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

G. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication except where specifically noted otherwise.

H. Miter and weld members, welds ground smooth.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.9 FINISHES

A. Prepare structural component surfaces in accordance with SSPC SP-2 at concealed locations and SSPC SP-6 at exposed locations.

B. Do not prime surfaces in direct contact with concrete, where field welding is required, or contact surfaces of steel-to-steel connections.

C. Shop prime all exposed interior steel with shop primer unless otherwise noted. Apply primer in one coat, to meet or exceed the minimum mil thickness required by the primer manufacturer.

D. All unexposed, concealed, or enclosed interior or exterior steel requires no finish.

E. All exposed exterior steel shall be galvanized after fabrication unless otherwise noted.

1. Galvanizing shall be in accordance with ASTM A123/A123M, on designated steel items. Provide minimum 1.25 ounces per square foot galvanized coating.

2. At galvanized members, touch-up all welds with zinc-rich primer.

F. Aluminum Finishes: As specified in this Section. Do not paint aluminum surfaces, unless required for protection of dissimilar materials.

G. Painting shall conform to applicable requirements of Section 09 91 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine job site conditions and verify field dimensions.

B. Verify structure or substrate is plumb, level, and ready to receive work.

C. Verify that appropriate backing, blocking, or structural reinforcing is provided at walls.

D. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate Sections.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Install manufactured items in accordance with manufacturer's printed instructions.

C. Allow for erection loads and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Field weld components indicated on shop drawings.

E. Perform field welding in accordance with AWS D1.1 for steel, AWS D1.3 for sheet steel, and AWS D1.2 for aluminum.

F. Obtain Architect's acceptance prior to site cutting or making adjustments not scheduled.

G. After erection, prime welds, abrasions and surfaces not shop primed, except surfaces to be in contact with concrete.

H. Post Setting in Concrete: Install support posts as indicated on Drawings.

1. Cast-In Posts: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
2. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch larger than outside diameter of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written

instructions. In exterior locations top shall be smoothed and shaped to shed water.

3. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions. In exterior locations, top shall be smoothed and shaped to shed water.

3.4 CLEANING

A. Inspect components after completing installation. Remove dirt and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION

SECTION 06 20 00

FINISH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Finish Carpentry Items, Other Than Shop Fabricated Casework.

B. Hardware and Attachment Accessories.

1.2 RELATED SECTIONS

A. Section 09 29 00 – Gypsum Board.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of this Project Manual.

C. Referenced Standards:

1. WI/AWI Architectural Woodwork Standards, including Supplemental Text.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Shop drawings shall include details and erection data associated with the work of other trades; location; materials, species of wood; quality grade; type of finish; profiles, dimensions; fastenings and clearances. Detail drawings shall be either full size or 3 inches = 1 foot.

1. The mill shall take and be responsible for all field measurements required for the proper fabrication and installation of the work. Show all field dimensions beyond control of mill.

a. Report any major discrepancy between the Drawings and the field dimensions to the Architect before fabrication of the work.

C. Samples: Submit two 6-inch x 6-inch samples of wall panel in specified finish.

1.5 QUALITY ASSURANCE

A. Standards of Construction: All work shall be manufactured in accordance with WI/AWI Architectural Woodwork Standards, all supplements, and in the grades hereinafter specified.

B. Installer's Qualifications: Use only journeymen finish carpenters who are thoroughly trained and experienced in the skills required for the cutting and fitting of trim and finish materials.

C. Installation Acceptance: All rejected work shall be removed and replaced with no additional cost to the Owner.

1.6 REGULATORY REQUIREMENTS

A. Composite Wood Products: Hardwood, plywood, particleboard, and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure (ATCM) for Composite Wood (17 CCR 93120 et seq.) Those materials not exempted under the ATCM must meet the specified emission limits, as shown in Table 5.504.4.5 of CALGreen.

1. Documentation shall be provided per CALGreen Section 5.504.4.5.3.

1.7 DELIVERY, STORAGE AND HANDLING

A. Delivery: Do not deliver to the job site until suitable storage space is available.

B. Storage, Handling and Protection: Provide all work or materials necessary to store, cover and protect all materials specified to be furnished and installed under this Section. Store all materials under cover in a well-ventilated enclosure and protect against extreme changes in temperature and humidity. Avoid any marring and keep the materials clean during handling and installation operations. Protect exposed finish work and materials after their erection from damage of any character. Work damaged shall be repaired or replaced by the Contractor without additional cost to the Owner.

PART 2 PRODUCTS

2.1 MATERIALS

A. All Material Grades and Construction shall be WI Custom Grade, including all supplements, unless specified or indicated otherwise. Semi-exposed and other components shall be as permitted by WI standards for construction quality specified herein except as otherwise detailed or specified. Moisture content shall be in accordance with WI/AWI Architectural Woodwork Standards.

B. Architectural Wall Panel System: Transforming Wall System as manufactured by Marlite or accepted equal. System shall consist of the following components:

1. Panels: 3/4 inch thickness by custom size as indicated on the Drawings.
    a. Wood Fiber Substrate:
        1) Medium density wood fiberboard, 3/4-inch thickness, conforming to ANSI A208.2, industrial-grade MDF and having no added formaldehyde.
    b. High Pressure Plastic Laminate Finish: Refer to Drawings for manufacturers, products, and colors.
2. Joinery: All edges shall be square cut. All edges shall be sealed.
3. Reveal: Type 6063-T5 heavy weight extruded aluminum 1/4 inch Narrow main rail and 1/4 inch Narrow cross spline horizontal and vertical channel reveals with horizontal edges square cut and vertical edges kerfed to accept cross splines. Shadowline decorative trim at perimeter conditions.
    a. Finish: clear anodized.
4. Trim: Type 6063-T5 heavy weight extruded aluminum with clear anodized factory finish.

C. Adhesives:

1. Marlite C-109 or accepted equal.
2. Adhesives shall meet VOC requirements of South Coast Air Quality Management District (SCAQMD) Rule No. 1168; VOC not to exceed 50 g/L.

PART 3 EXECUTION

3.1 CONDITIONS OF SURFACES

A. Examine all framing, grounds, stripping and blocking to secure finish carpentry and trim. Do not install finish carpentry and trim until all defects are corrected.

3.2 INSTALLATION

A. Workmanship Quality: All wood finishes shall be installed level, plumb and true, with members neatly and accurately scribed in place. All trim shall be applied in lengths as long as practicable. Butt joints shall be beveled together, exterior angles mitered and interior angles coped, unless shown otherwise. All exposed nails and screws shall be set for putty unless indicated or specified otherwise.

B. Architectural Wall Surfacing System: System shall be installed per manufacturer's recommendations and as follows:

1. Provide a smooth, straight, solid and clean wall surface.
2. Install system level, plumb and true.
3. Verify with drawings the proper panel location and layout, and for treatment of all perimeter conditions.
4. Install trim as shown and as required for a complete, finished system.

3.3 CLEAN-UP

A. General: Keep the premises in a neat, safe and orderly condition at all times during execution of this portion of the work, free of accumulations of sawdust, cut-ends and debris.

B. Clean-up: Upon completion of the work of this Section, remove all surplus materials, rubbish and debris from the premises and leave "broom clean."

END OF SECTION

SECTION 06 41 00

ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Custom fabricated casework.

B. Countertops.

C. Cabinet hardware.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 04 22 00 – Concrete Unit Masonry.

C. Section 07 92 00 – Joint Sealants.

D. Section 09 22 16 – Non-Structural Metal Framing.

E. Section 09 29 00 – Gypsum Board.

F. Divisions 21-23 – Mechanical.

G. Divisions 26-28 – Electrical.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ANSI 135.4 – Basic Hardboard.
2. ANSI A118.4 – Modified Dry Set Cement Mortar.
3. ANSI A208.1 – Particleboard.
4. ANSI A208.2 – Medium Density Fiberboard (MDF) for Interior Applications.
5. ANSI/BHMA 156.9 – Cabinet Hardware.
6. ANSI/HPVA HP-1 – Hardwood and Decorative Plywood.
7. ASTM D1037 – Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.
8. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
9. NEMA LD3 – High-Pressure Decorative Laminates.

10. NFPA 255 – Standard Method of Test of Surface Burning Characteristics of Building Materials.
11. PS 1 – Construction and Industrial Plywood.
12. PS 20 – American Softwood Lumber Standard.
13. UL 723 – Test for Surface Burning Characteristics of Building Materials.
14. WI/AWMAC – North American Architectural Woodwork Standards, including WI Supplemental Text.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01. Begin fabrication only after required approvals have been obtained.

B. Shop Drawings: Comply with Section 1 of WI/AWMAC North American Architectural Woodwork Standards – Basic Requirements for Architectural Millwork Shop Drawings. Submit as follows:

1. Submit two copies of shop drawings, 11 inch by 17 inch minimum size.
2. Architect furnished Drawings indicate form and profile concept only. Submit shop drawings to illustrate Fabricator's understanding of Architect's Drawings and to show intended fabrication details. Photocopies, traced copies, or other reproduction of Architectural Drawings will not be acceptable.
3. Prepare shop drawings using field verified dimensions. Report any major discrepancies between Architect's Drawings and field dimensions before work fabrication.
4. Indicate casework conditions, identified with location, grade, type of finish, and wood species.
5. Show casework in relation to adjacent construction with sectional drawings at full size or at 3 inch to 1 foot scale.
6. Coordinate dimensions of built-in equipment and fixtures. Show casework hardware indicating brand name and model used.
7. Show special accessory components not included in manufacturer's product data.
8. Show anchoring and attachment method. Show seismic restraint in accordance with CBC. Show method of scribing.
9. Furnish a WI Certified Compliance Label on shop drawings as specified in this Section.

C. Samples: Submit finish samples as follows:

1. Two 6 inch by 12 inch samples of each cut and species of lumber and plywood.
2. Two 6 inch by 12 inch samples of each type of countertop finish.
3. Two samples of each high pressure plastic laminate type and color specified.
4. One sample of each type of cabinet hardware.

D. Quality Assurance/Control Submittals: Submit the following in accordance with appropriate provisions of this Section:

1. Manufacturer qualifications.
2. Installer qualifications.
3. WI Compliance Certification.

1.5 SYSTEM DESCRIPTION

A. Casework design and construction shall be in accordance with WI/AWMAC North American Architectural Woodwork Standards as follows:

1. Grade: Custom.
2. Construction Style: A – Frameless.
3. Construction Type: Type I – Multiple Self Supporting Units.
4. Door and Drawer Front Style: Flush overlay.
5. Shelves: Conform to WI requirements subject to a fifty pounds per square foot uniformly spaced load not to exceed 200 pounds per shelf.
6. Provide seismic anchorage in accordance with CBC.
7. Non-housing casework will not be permitted.
8. Casework numbers on Drawings reference the Casework Design Series Elevations, Supplement 2 to WI/AWMAC North American Architectural Woodwork Standards – Appendix A.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Fabricator/Installer Qualifications: Firm specializing in fabricating and installing products specified in this Section with a minimum five years' experience. Fabricator/Installer shall be a WI Accredited Millwork Company.

B. Certification Requirements:

1. WI Compliance Certification: Submit a certification stating that millwork products furnished and installed meet all the requirements of the WI Grade or Grades specified.
2. WI Certified Compliance Label: Show WI Certified Compliance Label on the first page of each set of shop drawings.

C. Pre-Installation Meetings:

1. Conduct pre-installation meeting in accordance with Division 01.
2. Convene pre-installation meeting prior to commencing work of this Section.
3. Coordinate work in this Section with work in related Sections. Coordinate work with plumbing and electrical rough-in. Ensure orderly and efficient sequencing of installation of interdependent trades, construction elements, and include provisions for future work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver materials and manufactured products only when the area is ready for installation, broom clean, totally enclosed, and the relative humidity is fifty percent or less at 70 degrees F. Allow casework to acclimate to above conditions for 72 hours minimum prior to installation.

C. Storage and Protection: Store materials in a dry secure place. Protect from weather, surface contaminants, construction traffic, and other potential damage.

1.8 MAINTENANCE DATA

A. Submit in accordance with Division 01.

B. Provide cleaning and maintenance information. Include hardware adjustment information.

PART 2 PRODUCTS

2.1 SPECIAL ENVIRONMENTAL REQUIREMENTS

A. Hardwood, plywood, particleboard, and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure (ATCM) for Composite Wood (17 CCR 93120 et seq.) Those materials not exempted under the ATCM must meet the specified emission limits, as shown in Table 5.504.4.5 of CALGreen.

1. Documentation shall be provided per CALGreen Section 5.504.4.5.3.

2.2 LUMBER

A. Lumber: Conform to PS 20; Premium Grade in accordance with WI/AWMAC North American Architectural Woodwork Standards, Section 3. Dimensions as shown on Drawings. Properties as follows:

1. Moisture Content: Kiln dried; moisture content six percent to twelve percent.
2. Wood Species:

Use	Species
Framing, internal construction.	Douglas Fir

2.3 WOOD BASED PANELS

A. Formaldehyde emissions of wood-based panels shall not exceed limits established by the Department of Housing and Urban Development (HUD) and 24 CFR, Section 3208.308. Products containing urea-formaldehyde resins shall not be allowed.

B. Softwood Plywood: Veneer-core plywood; conforming to PS 1, Exposure 1, Grade A-A, Group 1. Nominal thickness shall be as indicated in this Section and as shown on Drawings.

C. Particleboard: Meets or exceeds ANSI A208.1, Class M2, NAF resin, minimum 45 pounds per cubic foot density. At wet areas, meet moisture resistant specifications for ANSI MR30 per ASTM D1037 for 24 hour water absorption.

1. Products:
   a. Encore as manufactured by SierraPine or accepted equal.
   b. FreeForm as manufactured by Collins Pine or accepted equal.

D. Medium Density Fiberboard (MDF): Meets or exceeds ANSI A208.2, Class SDF, NAF resin, minimum 45 pounds per cubic foot density. At wet areas, meet moisture resistant specifications for ANSI Grade 155 MR50 per ASTM D1037 for 24 hour water absorption.

1. Products:
   a. Standard MDF: Medite II as manufactured by SierraPine or accepted equal.
   b. Moisture-Resistant MDF: Medex as manufactured by SierraPine or accepted equal.

E. Hardboard: ANSI 135.4, Class 1 – Tempered; smooth-one-side (S1S), minimum sixty pounds per cubic foot density.

F. Thermally Fused Melamine: Thermoset decorative overlays pre-laminated to substrate (hardboard, particleboard, or MDF as specified in this Section) by thermal fusion; performance characteristics equal to a general purpose grade or liner grade high pressure laminate as per NEMA LD3.

2.4 PLASTIC LAMINATE

A. Manufacturers:

1. Acceptable Manufacturers:

a. Wilsonart International, Temple, TX; 800-433-3222; www.wilsonart.com.

b. Nevamar Decorative Surfaces, a division of Panolam Industries International, Inc., Shelton, CT; 877-726-6526; www.nevamar.com.

c. Formica Corporation, Cincinnati, OH; 800-367-6422; www.formica.com.

d. Pionite Decorative Surfaces, a division of Panolam Industries International, Inc., Shelton, CT; 877-726-6526; www.pionite.com.

e. Lamin-Art, Inc., Schaumburg, IL; 800-323-7624, www.laminart.com.

f. Abet Laminati, Richmond, CA; 800-228-2238; www.abetlaminati.com.

2. Substitutions: Under provisions of Division 01.

B. High-Pressure Decorative Laminates: NEMA LD3; grades and thickness as follows:

Use/Application	NEMA LD3 Grade	Min. Thickness
Horizontal surface where postforming is not required.	HGS or HGL	0.048 inch ± 0.005 inch
Exposed vertical surfaces of casework components where postforming is not required.	VGS	0.028 inch ± 0.004 inch
Cabinet liner.	CLS	0.020 inch
Backing sheet. Provide at backside of plastic laminated panel substrates to enhance dimensional stability where laminate finish is applied to only one surface.	BK	0.020 inch

C. Colors: As indicated on Drawings.

2.5 SOLID SURFACING

A. Manufacturers and Products:

1. Acceptable Manufacturers and Products:

a. Corian Solid Surfaces / DuPont, Wilmington, DE; 800-426-7426, www.corian.com. Product: Corian.

b. LG Hausys, Atlanta, GA; 865-544-4622, www.lgsurfaces.com. Product: Hi-Macs.

c. Aristech Acrylics LLC, Florence, KY; 800-428-6648, www.avonite.com. Product: Avonite Solid Surfacing.

d. Wilsonart International, Temple, TX; 800-433-3222, www.wilsonart.com. Product: Wilsonart Solid Surface.

e. LivingStone, Austin, TX; 866-433-2229, www.livingstonesurfaces.com. Product: Heartland.

2. Substitutions: Under provisions of Division 01.

B. Solid Surfacing: Non-porous homogeneous blend of acrylic or polyester alloys and fillers creating a solid surfacing material. Color and pattern shall extend throughout the material.

1. Thickness: 1/2 inch, unless otherwise indicated on Drawings.

2. Color: As indicated on Drawings.

C. Solid Surfacing Accessories:

1. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous non-porous joints, with a chemical bond.

2. Panel Adhesive: Manufacturer's standard neoprene-based panel adhesive.

3. Sealant: Manufacturer's standard mildew resistant, FDA and UL recognized silicone sealant in color matching or clear formulations.

2.6 ACCESSORIES

A. Edge Banding: PVC vinyl; 0.125 inch (3 mm) thick by 15/16 inch wide. Color and pattern shall closely match exposed door and drawer front laminate color and pattern as accepted by Architect.

B. Vinyl Countertop Edge: PVC vinyl; 0.125 inch (3 mm) thick. Color and pattern shall closely match countertop laminate color and pattern as accepted by Architect.

C. Fasteners: Nails, screws, and other fasteners of size and type best suitable for the purpose. Staples, screws or T-nails not permitted at exposed surfaces. Staples and nails not permitted in casework joinery.

D. Adhesives, Caulks, and Sealants:

1. Comply with provisions of Division 01. Adhesives, caulks, sealants, and fillers shall meet VOC requirements of South Coast Air Quality Management District (SCAQMD) Rule No. 1168.

2. Adhesives shall be selected for their ability to provide a durable, permanent bond and shall take into consideration such factors as materials to be bonded, expansion and contraction, bond strength, fire rating, and moisture resistance.

3. Wood Joinery: CS 35-61 Type II (water-resistant). Shall withstand cold-soak tests specified in ANSI/HPVA HP-1.

4. Laminate Adhesive: Water-based contact adhesive, type recommended by plastic laminate manufacturer.

5. Caulk: Clear, 100 percent silicone. Use to fill voids and joints between laminated components and adjacent surfaces.

6. Sealant: Mold and mildew resistant; type and composition recommended by substrate manufacturer to provide a moisture barrier at sink cutouts and other locations where unfinished substrate edges may be subjected to moisture.

2.7 CABINET HARDWARE

A. Hardware shall be furnished and installed as required to provide for a complete and operable casework installation. All hardware shall conform to ANSI/BHMA 156.9 Grade 2, except where a higher grade is specified.

B. Manufacturers:

1. Acceptable Manufacturers:

a. Accuride International, Inc., Santa Fe Springs, CA; 562-903-0200, www.accuride.com.

b. Amerock Corp., Mooresville, NC; 800-435-6959; www.amerock.com.

c. Doug Mockett & Company, Inc., Torrance, CA; 800-523-1269, www.mockett.com.

d. EPCO – The Engineered Products Co., Flint, MI; 888-414-3726 www.epcohardware.com.

e. Häfele America Co., Archdale, NC; 800-423-3531, www.hafele.com.

f. Hettich America L.P., Buford, GA; 800-777-1772, www.hettichamerica.com.

g. Knape & Vogt Mfg. Co., Grand Rapids, MI; 800-253-1561, www.knapeandvogt.com.

h. National Cabinet Lock / CompX International Inc., Mauldin, SC; 864-297-6655, www.compxnet.com/national.html.

i. RPC – Rockford Process Control, Rockford, IL; 815-966-2000, www.rpchingesandhardware.com.

2. Substitutions: Under provisions of Division 01.

C. Overlay Institutional Hinges: ANSI/BHMA 156.9 Grade 1.

1. Five-knuckle type; US26D satin chrome finish. Products: RPC Part No. 456, Häfele Cat. No. 354.65.400, or accepted equal.

D. Wire Pulls: 4-1/8 inch x 1-3/8 inch x 1/2 inch diameter steel handle; nickel matt finish. Product: Häfele Cat. No. 116.09.617, Epco Cat. No. MC401-4-DC, or accepted equal.

E. Drawer Slides:

1. Pencil drawers: Full extension; steel ball bearings; hold-in detent; silenced in and out; low profile; 1/2 inch side space; minimum 50 pounds rated load. Product: Accuride Model No. 2632, Knape & Vogt Model No. 8400, or accepted equal.

2. Box drawers: Full extension; steel ball bearings; hold-in detent; progressive movement; 1/2 inch side space; 100 pounds rated load. Product: Accuride Model No. 3832, Knape & Vogt Model No. 8405, or accepted equal.

3. File drawers (up to 24 inches wide): Minimum 1 inch over travel; steel ball bearings; hold-in detent; progressive movement; 1/2 inch side space; 150 pounds rated load. Product: Accuride Model No. 4034, Knape & Vogt Model No. 8505, or accepted equal.

F. Adjustable Shelf Supports: ANSI/BHMA 156.9 Grade 1; nickel plated zinc die-cast shelf supports, 5 mm pin diameter with additional pin for shelf. Product: Hettich Sekura 6 Cat. No. 079707, Häfele Cat. No. 282.24.720, or accepted equal.

G. Countertop Supports: Steel angles; sizes and configurations as indicated on Drawings. Paint finish under provisions of Section 09 91 00.

H. Countertop Brackets: Steel workstation bracket with 15 inch x 21 inch x 1/8 inch thick legs and minimum 1000 pound capacity. Bracket shall have a 3 inch x 3 inch 45 degree notch to allow for wall cleat and wiring. Product: Workstation Bracket by Futaba or accepted equal by Häfele or Knape & Vogt.

1. Finish: Manufacturer's standard powder coat finish, color as selected by Architect from full range of manufacturer's standard colors.

I. Elbow Catch: Heavy duty solid brass. Product: Epco Part No. 1018-N, or accepted equal.

J. Cabinet Locks:

1. General: All locks shall be BHMA certified.
2. Single: Deadbolt locks with 90 degree turn; key removable in both locked and unlocked positions. Provide two keys per lock. Provide strike bars at doors and angle strikes at drawers. Cylinder lengths: 7/8 inch at doors and 1-3/8 inch at drawers. Finish: US26D, satin chrome. Products:
   a. Doors: CompX National C8173 or accepted equal.
   b. Drawers: CompX National C8179 or accepted equal.
3. Gang Lock (face mounted): Disc tumbler gang lock for locking drawers in desk pedestals and multiple drawer applications. Key removable in both locked and unlocked positions. Product: CompX National D8838 with core plug, or accepted equal.
4. Gang Lock (side mounted): Disc tumbler gang lock for locking drawers in desk pedestals and multiple drawer applications. Key removable in both locked and unlocked positions. Product: National D8090-14A, or accepted equal.
5. All casework locks and keying shall match facility's casework needs and keying system. Locks shall be keyed in groups per functional operations.

K. Cable Grommets: 2-1/2 inch diameter plastic grommet; color as selected by Architect. Product: Doug Mockett & Company, Inc. Model EDP (flip-top tab), Häfele Cat. No. 429.99.324 (spring-loaded rotating segment in cover), or accepted equal.

2.8 FABRICATION

A. Fabricate and assemble casework components at the shop site to the maximum extent possible. Construction and fabrication of cabinets and their components shall meet or exceed WI grade requirements as indicated in this Section.

B. Closely fit casework at site. Provide filler inserts and trim where necessary, scribe for a tight fit.

C. Provide cutouts for inserts, grommets, and fittings. Install grommets where indicated on the drawings after site verification of locations and dimensions. Seal surfaces of cut edges.

D. Operable parts for all accessible casework shall comply with CBC Section 11B-309.

E. Plastic Laminates:

1. Apply plastic laminate in full uninterrupted sheets, consistent with manufactured sizes.
2. Fit corners and joints hairline. Slightly bevel arises.
3. Secure plastic laminated panels with concealed fasteners.
4. Apply laminate backing sheets to reverse side of panels with high-pressure decorative laminates on one face.

F. Sheet Materials Application:

Use/Application		Thickness	Wood-Based Panel
Casework carcass.		Min. 3/4 inch	Plywood, Particleboard, or MDF
Doors and drawer false fronts.		3/4 inch	Particleboard or MDF
Drawer box.	Sides, backs, and subfronts.	Min. 1/2 inch, Max. 5/8 inch	Plywood, Particleboard, or MDF
	Bottom.	Min. 1/4 inch	Hardboard or MDF
Cabinet backs.		Min. 1/4 inch	Hardboard or MDF
Laminate clad countertops.		Min. 3/4 inch	Plywood, Particleboard, or MDF
Shelves: up to 32 inch span.		Min. 3/4 inch	Plywood, Particleboard, or MDF
Shelves: 32 inch up to 49 inch span.		Min. 1 inch	Plywood

G. Casework Carcass:

1. Glue frame components together. Brace top corners, bottom corners and cabinet bottoms with hardwood blocks, or metal or plastic braces.
2. Joinery Method: Acceptable joinery methods shall be as follows:
   a. Tops, exposed ends, and bottoms:
      1) Steel European assembly fasteners 1-1/2 inch from end, 5 inches on center. Fasteners shall not be visible on exposed parts.
      2) Doweled and glued under pressure – approximately four dowels per 12 inches of joint.
      3) Stop dado, glued under pressure, and either nailed or screwed. Fasteners shall not be visible on exposed parts.
      4) Spline or biscuit and glued under pressure.
   b. Cabinet backs (wall hung cabinets):
      1) Wall hung cabinet backs must not be relied upon to support the full weight of the cabinet and its anticipated load for hanging/mounting purposes. Method of back joinery and hanging/mounting mechanism should transfer the load to case body members.
      2) Fabrication method: Full bound, capture in grooves on cabinet sides, top, and bottom. Cabinet backs for floor standing cabinets shall be side bound, captured in grooves, glued and fastened to top and bottom.

H. Drawer Assembly:

1. Drawer box with drawer false front.
2. Acceptable joinery methods:
   a. Multiple dovetail (all corners) or French dovetail front/dadoed back, glued under pressure.
   b. Doweled, glued under pressure.
   c. Lock shoulder, glued and pin nailed.
   d. Bottoms shall be set into sides, front, and back, 1/4 inch deep groove, with a minimum 3/8 inch standing shoulder.

3. File Drawers: Unless otherwise indicated, direction of file folders shall be parallel to drawer door. Provide adequate, clear inside dimensions for hanging file folders. Minimum clear inside drawer dimensions shall be as follows:
   a. Letter size file folders: Minimum 13-1/4 inch wide by 10-1/2 inch high.
   b. Legal size file folders: Minimum 16-1/4 inch wide by 10-1/2 inch high.

I. Shelving:
1. Fixed shelves: Dadoed or doweled into cabinet sides.
2. Adjustable shelves: 0.197 inch bore holes at 1-1/4 inch on center.

J. Laminate Countertops and Backsplash:
1. Edge Style: As indicated on Drawings.
2. Mechanically fasten back splash to countertops at minimum 16 inches on center.
3. Substrate shall be moisture-resistant where countertops receive sinks, lavatories, or are subject to liquids.

2.9 FINISH

A. Finish – Laminated Casework:
1. Drawer box: Thermally fused melamine.
2. Semi-exposed surfaces, as defined in WI/AWMAC North American Architectural Woodwork Standards Section 10:
   a. Cabinet with doors: Thermally fused melamine.
   b. Cabinets with open shelves: High-pressure decorative laminate.
3. Exposed surfaces, as defined in WI/AWMAC North American Architectural Woodwork Standards Section 10: High-pressure decorative laminate with PVC edge banding.
4. Doors and drawer false fronts: High-pressure decorative laminate with PVC edge banding.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify field measurements, dimensions, location and layout.

B. Verify location and sizes of utility rough-in associated with work of this Section.

C. Verify adequacy of backing and support framing.

D. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 INSTALLATION

A. Install in accordance with accepted shop drawings and with applicable WI grade requirements as indicated in this Section.

B. Install fabricated assemblies, level, plumb, square, and true to line, in locations as shown on Drawings.

C. Anchorage:

1. Attach and anchor casework securely to floors and walls with mechanical fasteners appropriate for the substrate.
2. Use concealed fasteners to attach and secure casework components, countertops, and plumbing fixtures.

D. Carefully scribe casework abutting other components with a maximum gap of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Install solid surfacing per manufacturer's written instructions.

F. Install cable grommets in countertops at all casework knee-spaces and where shown on Drawings.

3.3 ADJUSTING

A. Adjust moving or operating parts for smooth, uniform operation.

B. Drawer slides shall be adjusted such that the drawer does not act as the stop.

3.4 CLEANING

A. Clean as recommended by manufacturer. Do not use materials or methods which may damage finish surface or surrounding construction.

END OF SECTION

SECTION 07 13 26

SELF-ADHERING SHEET WATERPROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Self-adhesive elastomeric sheet membrane waterproofing for:
   1. Installation as air/water barrier at wall areas.

B. Accessories.

1.2 RELATED SECTIONS

A. Section 07 92 00 – Joint Sealants.

B. Section 09 29 00 – Gypsum Board: Mat-Faced Gypsum Sheathing.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:
   1. ASTM D412 – Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
   2. ASTM D1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
   3. ASTM D3767 – Standard Practice for Rubber-Measurement of Dimensions.
   4. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
   5. ASTM D6135 – Standard Practice for Application of Self-Adhering Modified Bituminous Waterproofing.
   6. ASTM G90 – Standard Practice for Performing Accelerated Outdoor Weathering of Nonmetallic Materials using Concentrated Natural Sunlight - EMMAqua test.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Submit product data for each product specified in this Section.

C. Samples: Samples of materials or a written statement shall be submitted to the Architect within thirty days after the award of contract outlining the waterproofing system materials to be used.

D. Manufacturer's Instructions: Furnish manufacturer's printed instructions for the installation of membranes, including procedures and materials for splicing and bonding.

E. Certificates: Submit manufacturer's certificate of compliance.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Application shall be done only by an application firm normally engaged in this business and approved by the material manufacturers. All work shall be performed by qualified applicators working under an experienced supervisor.

B. Manufacturer's Representation During Installation: A qualified representative of the membrane manufacturer shall be present periodically during the work on the waterproof membrane system to assure compliance with the specifications and recommendations of the manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to the job site in original unbroken packages bearing the manufacturer's label. Material shall be stored above the ground in a dry location. Containers shall be stored in such a manner as to prevent damage.

B. Cover materials and store in dry condition between temperatures of 40 degrees F and 90 degrees F. Install within one year of date of manufacture. Do not store at elevated temperatures which will reduce the shelf life of the product.

1.7 JOB AND ENVIRONMENTAL CONDITIONS

A. Job Conditions: The Membrane Waterproofing Contractor shall acquaint himself with all conditions, general construction methods, and sequence to be employed. No extras will be permitted for his failure to do so.

B. Environmental Conditions:

1. Temperature: Surface temperature shall not be higher than 90 degrees F and no lower than 40 degrees F during application of membrane.
2. Weather: Do not apply during periods of precipitation or when rain is expected for period of application, and for at least three hours following application.
3. Ventilation: Provide positive ventilation to all areas not subject to natural ventilation during application and curing periods.

1.8 WARRANTY

A. Membrane waterproofing shall be warrantied for two years from the date of filing Notice of Completion against all defects in materials and workmanship. Warranty shall also cover damage due to leaks, defective materials, and installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design: GCP Applied Technologies, Products:

1. Walls: Grace Ice and Water Shield HT.
2. Primer: Perm-A-Barrier Primer Plus.

B. Carlisle.

C. W. R. Meadows.

D. Henry Company.

E. Substitutions: Under provisions of Division 01.

2.2 MATERIALS – WALL AREAS

A. Elastic Sheet Membrane Waterproofing:

1. Material: Cold applied, self-adhering membrane composed of a rubberized asphalt adhesive and interwound with a disposable release sheet. Provide an embossed, slip resistant surface on the high-performance film with UV barrier properties.
2. Membrane Thickness: 40 mils per ASTM D3767 Method A.
3. Membrane Tensile Strength: MD 33 lbf/in, CD 31 lbf/inch per ASTM D412 Die C Modified.
4. Membrane Elongation: 250 percent per ASTM D412 Die C Modified.
5. Low Temperature Flexibility: Unaffected at -20 degrees F per ASTM D1970.
6. Maximum Permeance: 0.05 perms per ASTM E96.
7. Maximum Material Weight Installed: 0.22 pounds per square foot per ASTM D461.
8. Service Temperature: 240 degrees F per ASTM D1204
9. Adhesive: Rubberized asphalt adhesive containing post-consumer recycled content, contains no calcium carbonate, sand or fly ash.
10. Exposure: Can be left exposed for a maximum of 120 days from date of installation per ASTM G90 – EMMAqua test.

B. Primer: VOC compliant, low odor, water-based primer provided by sheet waterproofing manufacturer, which imparts a high tack finish on the treated substrate.

C. Sealant: Type specified in Section 07 92 00.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive membrane waterproofing to assure that they are smooth, dry and free of foreign material, moisture and unevenness which would prevent the execution and quality of application of the membrane waterproofing as specified.

B. Do not proceed with application of waterproofing systems until defects are corrected.

3.2 PREPARATION OF SURFACES - GENERAL

A. Surfaces shall be dry, clean, smooth and free from projections or holes that may cause puncture of membrane. Substrate shall be absolutely surface dry for proper adhesion of membrane.

B. Cleaning: Clean surfaces to remove all curing compounds, loose dirt, moisture, grease, dust and other foreign material. Sweep or vacuum surface clean prior to membrane installation.

3.3 APPLICATION OF PRIMER

A. Apply primer over substrate per manufacturer's recommendations.

B. Allow primer to fully dry prior to start of membrane installation.

3.4 APPLICATION OF MEMBRANE AT WALL AREAS

A. Install membrane per ASTM D6135 and manufacturer's recommendations.
   1. Schedule installation such that membrane is covered by finish materials within 120 days after installation.
   2. Do not install membrane on wet or frozen substrates.
   3. Install when surface temperature of substrate is a minimum of 40 degrees F and rising.
   4. Remove dust, dirt, loose materials, and protrusions from substrate surface.
   5. Install membrane on clean, dry, continuous substrate. Fill voids and damaged or unsupported areas prior to installation.
   6. Install membrane such that all laps shed water. Work from the low point to the high point at all times.
   7. Side laps shall be minimum 4 inches and end laps shall be minimum 8 inches.
   8. Flash penetrations and repair damage using manufacturer's recommended methods.
   9. Seal all reversed laps and exposed or cut membrane edges with continuous bead of compatible silicone weather barrier sealant.

3.5 CLEAN-UP

A. At the completion of the work of this Section, all surfaces and areas adjoining the membrane shall be left in a clean condition. All cartons, pails and equipment shall be removed from the premises.

B. Clean any stains on materials that would be exposed in the completed work.

END OF SECTION

SECTION 07 19 19

SILICONE WATER REPELLENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Room temperature vulcanizing (RTV) silicone rubber water repellent and anti-graffiti coatings.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM C793 – Standard Test Method for Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants.
2. ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
3. ASTM D746 – Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
4. ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness.
5. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data: Submit the following:

1. Manufacturer’s descriptive literature and product data sheets.
2. MSDS.

C. Quality Assurance/Control Submittals:

1. Submit manufacturer qualifications information.
2. Submit applicator qualifications information.
3. VOC content limits certification.
4. Provide narrative description of protection of surrounding areas and non-masonry surfaces, surface preparation, application, and final cleaning.
5. Manufacturer’s application instructions.
6. Manufacturer’s field reports.

D. Closeout Submittals:

1. Manufacturer's warranty certificate.
2. Cleaning and maintenance data.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section with a minimum ten years' experience.
2. Applicator Qualifications: Firm specializing in installing work specified in this Section acceptable to manufacturer with experience on at least five projects of similar nature in the past three years of similar nature. Provide a complete list of completed projects, including project name and location, names of Owner and Architect including contact information, and description of products, substrates, and method of application.

B. Regulatory Requirements:

1. Comply with the local Air Quality Management District's (AQMD) rules and regulations.
2. Provide products that meet requirements of local AQMDs for volatile organic compounds (VOC).

C. Certifications:

1. VOC Content Limits Certification: Submit certification that coating product complies with local air quality management district's regulations and prescribed requirements for volatile organic compounds (VOC).

D. Field Sample (Sample Panel):

1. Before full-scale application, review manufacturer's product data sheets to determine the suitability of each product for the specific surfaces. Apply coating to sample panel (CMU mockup) to determine appropriate strength, coverage rates, compatibility, effectiveness, surface preparation, application procedures and desired results.
2. Apply coating to sample panel as directed by Architect, minimum 72 inches wide by 72 inches high for each type of substrate, in accordance with manufacturer's written instructions. Allow 24 hours or until panel is thoroughly cured before evaluating final appearance and results. Do not begin full-scale application until sample panel is reviewed and accepted by the Architect.
3. Allow coating to cure at least seven days prior to testing using low-pressure tube test (RILEM) or masonry absorption test (MAT) methods.

E. Tests:

1. Perform tests in accordance with Division 01.
2. Sample Panel: Owner appointed testing laboratory shall perform tests on sample panel using low-pressure tube test (RILEM) or masonry absorption test (MAT) methods.
3. Executed Work: Owner appointed testing laboratory shall perform two tests for each type of substrate on executed work at randomly selected areas designated by Architect.
4. Owner shall pay for these tests; however, retesting required because of non-conformance shall be paid for by the Contractor.

F. Pre-Installation Meetings:

1. Conduct pre-installation meeting in accordance with Division 01.
2. Convene pre-installation meeting prior to commencing work of this Section. Require attendance of parties directly affecting work of this Section including Contractor, Architect, applicator, and manufacturer's representative. Review environmental requirements, sample panel procedures, protection of surrounding areas and non-masonry surfaces, surface preparation, application, field quality control, final cleaning, coordination with other work, and extended warranty requirements.
3. Coordinate work in this Section with work in related Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Storage and Protection: Store containers in a cool, dry place. Keep away from sparks and open flame. Store and handle materials in accordance with manufacturer's written instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Temperature: Water repellent product may be applied at any temperature, providing that there is no frozen moisture present in the substrate. When applied at temperatures below 40 degrees F, the product may cure at a slower rate. Optimal ambient temperature for applying product is 40 degrees F to 95 degrees F.

B. Do not apply material if the substrate is wet or contains frozen moisture. Allow substrate to dry for a minimum of 48 hours after rain or power washing.

C. Do not apply material during inclement weather or if precipitation is expected within 12 hours.

D. Do not use spray methods of application under windy conditions.

1.8 WARRANTY

A. Comply with provisions of Division 01.

B. Provide manufacturer's extended warranty – Five years horizontal and ten years vertical warranty.

C. Prior to applying coating, review and comply with manufacturer's warranty processing requirements – do not proceed until warranty processing requirements have been met.

1.9 OPERATIONS AND MAINTENANCE DATA

A. Submit under provisions of Division 01.

B. Provide cleaning and maintenance data.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Acceptable Manufacturers and Products:

1. Professional Products of Kansas, Inc., Wichita, KS; 800-676-7346, www.watersealant.com. Products:

a. Professional Water Sealant Super Strength (15 percent Silicone Rubber). Provide one coat where water repellent coating is required and two coats where anti-graffiti coating is required. Refer to Drawings for locations.

2. or accepted equal.

B. Substitutions: Under provisions of Division 01.

2.2 WATER REPELLENT/ANTI-GRAFFITI COATING

A. Penetrating sealer formulated using RTV silicone rubber. Penetrates without altering the natural appearance of the substrate. Inorganic; not affected by ultraviolet rays, ozone, salt spray, and acid rain. Breathable; allows moisture-vapor to escape while preventing liquid penetration. Flexible; bridges hairline cracks and allows for building movement.

B. Properties:

1. Perm Rate (ASTM E96, Method B): 7.06.
2. Durometer Hardness (ASTM D2240, Shore A): 27.
3. Tensile Strength (ASTM D412): 320 MPa.
4. Elongation (ASTM D412): 400 percent.
5. Brittle Point (ASTM D746): -100 degrees F.
6. Accelerated Weathering (ASTM C793): No change after 4000 hours.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate conditions to determine that conditions are acceptable to receive coating. Verify the following:

1. The required joint sealants have been installed.
2. Masonry and mortar has cured a minimum of 28 days.
3. Surface to be treated is clean, dry, and contains no frozen moisture.
4. Environmental conditions are appropriate for application.

B. Report unacceptable conditions to the Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 PREPARATION

A. Protection:

1. Protect surrounding areas such as but not limited to glass, landscaping, building occupants, pedestrians, vehicles, and non-masonry surfaces during the work from contact with coatings.
2. Take special precautions to prohibit fumes from entering the building being treated. Cover and turn-off ventilation systems and fresh air intakes.

B. Surface Preparation:

1. Clean all dirt, oil, grease, mold, mildew, efflorescence, or any other coating or material from surfaces that could interfere with penetration, performance, adhesion, or aesthetics of coatings per coating manufacturer's recommendations. Allow surfaces to dry completely before application of coatings.
2. Repair, patch, and fill all cracks, voids, defects, and damaged areas in surface in a manner acceptable to Architect. Allow repair materials to cure completely before application of coatings.
    a. Anything larger than hairline cracks shall be repaired prior to application of coating. Hairline cracks are defined as cracks that cannot be seen when standing back six feet from the surface of the masonry.
3. Seal all open joints.
4. Allow masonry surfaces to cure for a minimum of 28 days before application of coatings.

3.3 APPLICATION

A. Apply coating to substrates in accordance with manufacturer's written instructions, environmental requirements, and application procedures determined from test panel results accepted by Architect.

B. Apply to clean, dry, cured, and properly prepared surfaces.

C. Apply coating after sealants have fully cured. Coordinate with Section 07 92 00.

D. Apply material as shipped by manufacturer – do not dilute.

E. Apply material using a high-volume, low pressure, pump-up sprayer (between 40-50 psi), with solvent resistant fittings, foam roller, or brush of natural bristle, or foam. Where anti-graffiti protection is required, allow first coat to dry to the touch before applying second coat.

1. Vertical applications: apply in a flood coat, from top to bottom, being sure to obtain a 4 inch to 6 inch rundown of product from the point where the spray makes contact with the surface. Work all the way down the building covering the rundown as you go. Avoid excessive overlapping.
2. Horizontal applications: If surface pooling or puddling occurs, back-roll, brush, or broom away excess material. Complete penetration must occur. Avoid excessive overlapping. Material curing on surface may cause whiting or slickness.

F. Coating shall be applied to entire length and height of each wall segment (corner to corner). Do not stop coating application anywhere along each wall segment.

3.4 FIELD QUALITY CONTROL

A. General: Comply with requirements of Division 01.

B. Coating work shall be inspected by Owner's representative, Architect, Project Inspector, and manufacturer's representative; and compared with accepted test panel.

C. Manufacturer's Field Services: Provide services of manufacturer's authorized field representative to verify specified products are used; protection, surface preparation, and application of water repellents are in accordance with manufacturer's written instructions; and the test panel is accepted by Architect.

3.5 CLEANING

A. Clean as recommended by manufacturer. Do not use materials or methods which may damage finish surface or surrounding construction.

B. Upon completion of coating application, remove all equipment, materials and debris, leaving the area in an undamaged and acceptable condition. Dispose of coating containers according to state and local environmental regulations.

C. Clean, repair, restore, or replace to the satisfaction of the Architect, all materials, landscaping, and all non-masonry surfaces damaged by exposure to coatings at no additional cost to Owner.

END OF SECTION

SECTION 07 21 00

THERMAL INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Thermal insulation in exterior wall construction.

B. Exterior wall rigid sheathing/insulation.

1.2 RELATED SECTIONS

A. Section 05 40 00 – Cold-Formed Metal Framing.

B. Section 09 29 00 – Gypsum Board.

C. Section 09 81 00 – Acoustic Insulation.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
2. ASTM C665 – Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
3. ASTM C711 – Standard Test Method for Low-Temperature Flexibility and Tenacity of One-Part, Elastomeric, Solvent-Release Type Sealants.
4. ASTM C1289 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
5. ASTM D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
6. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
7. UL 723 – Test for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Provide data on product characteristics, performance criteria, and limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed California Quality Standards.

1.5 SYSTEM DESCRIPTION

A. Materials of this Section: Provide continuity of thermal barrier at building enclosure elements.

1.6 SUSTAINABLE DESIGN REQUIREMENTS

A. Products of this Section shall meet the requirements of the California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Version 1.2, January 2017 (Emission testing method for California Specification 01350).

B. Thermal insulation products shall be formaldehyde-free.

C. Recycled Content: Minimum twenty percent post-consumer.

1.7 COORDINATION

A. Coordinate work with other trades under provisions of Division 01.

PART 2 PRODUCTS

2.1 GLASS FIBER BATT INSULATION

A. Acceptable Manufacturers:
   1. Knauf Insulation, Shelbyville, IN; 317-398-4434, www.knaufusa.com. Product: EcoBatt.
   2. Owens-Corning, Toledo, OH; 800-438-7465, www.owenscorning.com.
   3. Certainteed Corp., Insulation Group, Valley Forge, PA; 800-233-8990, www.certainteed.com.
   4. Johns Manville, Denver, CO; 800-654-3103, www.specJM.com.
   5. Substitutions: Under provisions of Division 01.

B. Batt Insulation: Preformed glass fiber batt in accordance with 2022 CBC Section 720, ASTM E84, and UL 723, conforming to the following:
   1. Facing: Faced on one side with foil reinforced kraft (FSK) face; Type III, Class A per ASTM C665; flame spread 25 and smoke developed 50 per ASTM E84.

C. Accessories:
   1. Tape: Polyester self-adhering type, mesh reinforced, 2 inches wide.

2.2 RIGID SHEATHING/INSULATION

A. Acceptable Manufacturers:
   1. Dow Building Solutions, Midland, MI; 866-583-2583, www.dowbuildingmaterials.com. Product: Thermax Sheathing. ICC-ES Report #ESR-1659.
   2. Rmax, Inc., Dallas, TX; 800-527-0890, www.rmax.com. Product: TSX-8500.
   3. Atlas Roofing Corporation, Atlanta, GA; 770-952-1442, www.atlasroofing.com. Product: EnergyShield Pro.
   4. Substitutions: Under provisions of Division 01.

B. Rigid Sheathing Insulation: ASTM C1289, Type I, Class 1 or Class 2, Grade 3; polyisocyanurate foam core bonded to 1.0 mil thick smooth reflective aluminum foil facers on both faces.

1. Thickness: 1-1/2 inch.
2. Compressive Strength: 25 psi minimum per ASTM D1621.
3. Surface Burning Characteristics: Flame Spread: 25; Smoke Developed: less than 450 per ASTM E84.
4. Thermal Resistance Value: Minimum 6.5 per inch of thickness per ASTM C518.

C. Accessories:

1. Fasteners: Insulated sheathing manufacturer's recommended polymer or other corrosion protective coated steel screw fasteners and washers for anchoring sheathing to metal wall framing. Fastener length and size based on wall sheathing thickness.
2. Liquid Spray Flashing: Insulation manufacturer's recommended board joint commercial liquid spray flashing and sealant for sealing joints, seams, window openings, door openings, counter-flashing, and penetrations through the insulation layer.
3. Flashing Tape: Insulation manufacturer's recommended tape for counter-flashing and penetrations through the insulation layer. Tape shall meet ASTM C711 for self-adhering flashing.
4. Penetration Filler: Insulated sheathing manufacturer's recommended single-component polyurethane low-pressure foam sealant for sealing penetrations of insulated sheathing, meeting ASTM E84 standard test method for surface burning characteristics of building materials.
5. Gap Air Infiltration Filler: Insulated sheathing manufacturer's recommended two component, quick cure polyurethane foam, meeting ASTM E84 standard test method for surface burning characteristics of building materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing site conditions.

B. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

3.2 INSTALLATION – BATT INSULATION

A. Install insulation in accordance with insulation manufacturer's instructions and with the flame spread rating and smoke density requirements of CBC Section 720, ASTM E84, and UL 723.

B. Install in exterior walls full width, depth, and height of cavity, without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.

E. Install with factory applied vapor retarder membrane facing interior side of building spaces. Lap ends and side flanges of membrane over framing members.

F. Securely fasten and anchor insulation in place to prevent displacement or sagging of material in all areas.

1. At metal stud walls, the insulation shall be wired in place with two #14 spring steel wires, one within 12 inches of the top and one at the mid-point of each stud bay.

2. At underside of metal decking, install using epoxy adhesive applied impaling pins and self-locking washers at 24 inches on center or as recommended by manufacturer for a finished appearance. The installation of impaling pins through the low metal flutes in the metal decking will also be acceptable.

G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

3.3 INSTALLATION – RIGID SHEATHING/INSULATION

A. Install insulation in accordance with insulation manufacturer's instructions and with the flame spread rating and smoke density requirements of CBC Section 2603.

B. Place insulation over exterior sheathing and fasten to exterior metal stud wall framing using insulation manufacturer’s recommended type and length screw fasteners with washers. Abut panels tightly together and around openings and penetrations.

1. Install insulation panels horizontally with correct surface, per the manufacturer, to the exterior. Use maximum lengths to minimize number of joints. Locate edge joints parallel to and on framing. Center end joints over supports and stagger in each course. Provide additional framing wherever panel joints do not bear against framing plate or sill members.

2. Fasten panels to each support with fasteners spaced 12 inches on center at perimeter of the panel and 16 inches on center in panel field. Set back perimeter fasteners 3/8 inch from edges and ends of panel units. Drive fasteners to bear tight and flush with surface of insulation. Do not overdrive fastener causing damage to the insulation board facer. Perimeter fasteners can be detailed to bridge the gap of abutting board joints due to the 2 inch diameter of the washer used to fasten the board to the studs. Maximum of two board joints may be bridged per fastener.

3. Install flashing at end and edge joints in accordance with insulation manufacturer’s joint sealing recommendations.

4. Install flashing behind wall tie and mechanical fastening assemblies for rain screen claddings according to manufacturer’s recommendations.

5. Seal sheathing joints and penetrations of sheathing in accordance with insulation manufacturer’s joint and penetration sealing recommendations.

END OF SECTION

SECTION 07 25 00

WEATHER BARRIERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Weather barrier membrane.

B. Seam tape.

C. Flexible flashings.

D. Fasteners.

E. Accessories.

1.2 RELATED SECTIONS

A. Section 05 40 00 – Cold-Formed Metal Framing.

B. Section 07 41 00 – Metal Wall Panels.

C. Section 07 62 00 – Sheet Metal Flashing and Trim.

D. Section 08 41 13 – Aluminum-Framed Entrances and Storefronts.

E. Section 09 24 00 – Portland Cement Plastering.

F. Section 09 29 00 – Gypsum Board: Mat-Faced Gypsum Sheathing.

1.3 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
2. ASTM C1193 – Standard Guide for Use of Joint Sealants.
3. ASTM D882 – Test Method for Tensile Properties of Thin Plastic Sheeting.
4. ASTM D1117 – Standard Guide for Evaluating Non-Woven Fabrics.
5. ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials.
6. ASTM E96 – Test Method for Water Vapor Transmission of Materials.
7. ASTM E1677 – Specification for Air Retarder Material or System for Framed Building Walls.

8. ASTM E2178 – Test Method for Air Permeance of Building Materials.
9. ASTM E2357 – Test Method for Determining Air Leakage of Air Barrier Assemblies.
10. AATCC Test Method 127 – Water Resistance: Hydrostatic Pressure Test.
11. TAPPI Test Method T-410 – Grams of Paper and Paperboard (Weight per Unit Area).
12. TAPPI Test Method T-460 – Air Resistance of Paper (Gurley Hill Method).

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Submit manufacturer current technical literature for each component specified in this Section.

C. Samples: Two samples each of weather barrier membrane and flashings, minimum 8-1/2 inches by 11 inch.

D. Quality Assurance Submittals:
1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
2. Manufacturer Instructions: Provide manufacturer's written installation instructions and details.
3. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier assembly installation.

E. Closeout Submittals:
1. Submit under provisions of Division 01.
2. Weather Barrier Warranty: Manufacturer's executed warranty form with authorized signatures and endorsements indicating date of Substantial Completion.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Installer shall have experience with installation of specified weather barrier and flexible flashing assemblies under similar conditions.
2. Installation shall be in accordance with weather barrier manufacturer's installation guidelines and recommendations.

B. Single Source Responsibility: Provide building wrap, flashings, and accessory materials from a single manufacturer to ensure system compatibility and quality, and to comply with manufacturer's warranty requirements.

C. Pre-installation Meeting:
1. Conduct pre-installation meeting in accordance with provisions of Division 01.
2. Hold a pre-installation conference, two weeks prior to start of weather barrier installation. Attendees shall include Contractor, Architect, installer, Owner's Representative, and weather barrier manufacturer's designated representative.

3. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of weather barrier assembly materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle products and materials under provisions of Division 01.

B. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Store weather barrier materials as recommended by weather barrier manufacturer.

1.7 SCHEDULING

A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows and flashings to provide a weather-tight barrier assembly.

B. Schedule installation of weather barrier materials and exterior cladding within nine months of weather barrier assembly installation.

1.8 WARRANTY

A. Product and Labor Warranty: Weather barrier manufacturer shall warranty weather barrier assemblies for a period of ten years from date of Project Completion.

1. Weather barrier manufacturer's approval for warranty is required prior to assembly installation.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design: DuPont Building Innovations, Wilmington, DE; (800) 448-9835, http://construction.tyvek.com. Products:

1. DuPont Tyvek CommercialWrap D.
2. DuPont FlexWrap NF.
3. DuPont StraightFlash.

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Building Wrap: High-performance, flash spun-bonded olefin, non-woven, non-perforated weather barrier and related assembly components.

B. Performance Characteristics:

1. Air Penetration Resistance: <0.04 cfm/ft^2 at 1.57 psf, when tested in accordance with ASTM E2357. Type 1 per ASTM E1677.
2. Water Vapor Permeance: 30 perms, when tested in accordance with ASTM E96, Procedure A.

3. Water Penetration Resistance: Hydrostatic head resistance greater than 7.7 feet when tested in accordance with AATCC Test Method 127.
4. Basis Weight: Minimum 2.4 ounces per square yard, when tested in accordance with TAPPI Test Method T-410.
5. Air Penetration Resistance: >750 seconds/100cc, when tested in accordance with TAPPI Test Method T-460.
6. Breaking Strength: Minimum 33/41 lbs/in., when tested in accordance with ASTM D882.
7. Tear Resistance: 6/9 pounds, when tested in accordance with ASTM D1117.
8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 15, Smoke Developed: 25.

2.3 FLEXIBLE FLASHINGS

A. Flexible membrane flashing materials for openings and penetrations.

B. Straight flashing membrane materials for flashing window openings and sealing penetrations.

2.4 ACCESSORIES

A. Seam Tape: DuPont Tyvek Tape, three inches wide, as manufactured by DuPont Building Innovations.

B. Fasteners: Tyvek Wrap Cap Screws, as manufactured by DuPont Building Innovations.
   1. 1-5/8 inch corrosion resistant screws with 2-inch diameter high density polyethylene cap washers with UV inhibitors.

C. Sealants:
   1. Provide sealants that comply with ASTM C920, elastomeric polymer sealant to maintain watertight conditions. All sealants shall be California VOC compliant.
   2. Acceptable Products:
      a. DuPont Commercial Sealant.
      b. Dow Corning 756.
      c. Tremco 830.
      d. Tremco Butyl.
      e. Other sealants recommended by the weather barrier manufacturer.

D. Adhesives:
   1. Provide adhesive recommended by weather barrier manufacturer. All adhesives shall be California VOC compliant.

E. Primers for Flashings:
   1. Provide flashing manufacturer synthetic rubber-based, spray applied primer to assist in adhesion between substrate and flashing. All primers shall be California VOC compliant.
   2. Acceptable Products:
      a. DuPont Adhesive Primer.
      b. Other primers recommended by the flashing manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.2 INSTALLATION - WEATHER BARRIER

A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations and as indicated on Drawings.

B. Install weather barrier prior to installation of windows and exterior cladding materials.

C. Start weather barrier installation at a building corner, leaving 6 inches to 12 inches of weather barrier extended beyond corner to over lap.

D. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent layers installed in a shingling manner to overlap lower layers. Maintain weather barrier plumb and level.

E. Sill Plate Interface: Extend lower edge of weather barrier over sill plate interface a minimum of 1 inch. Secure to foundation with elastomeric sealant as recommended by weather barrier manufacturer.

F. Window Openings: Extend weather barrier completely over openings.

G. Overlap weather barrier:

1. Exterior Corners: Minimum 12 inches.
2. Seams: Minimum 6 inches.

H. Weather Barrier Attachment:

1. Attach weather barrier to steel studs through exterior sheathing. Secure using weather barrier manufacturer recommend fasteners, space 6 inches to 18 inches vertically on center along stud line, and 24 inches on center, maximum horizontally.

I. Apply 4 inch by 7 inch piece of DuPont StraightFlash to weather barrier membrane prior to the installation cladding anchors.

3.3 SEAMING

A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.

B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.4 OPENING PREPARATION

A. Flush cut weather barrier at edge of sheathing around full perimeter of opening.

B. Cut a head flap at 45-degree angle in the weather barrier at opening head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

3.5 FLEXIBLE FLASHINGS

A. Cut wide DuPont FlexWrap a minimum of 4 inches wider than stud depth and 12 inches longer than length of sill rough opening.

B. Cover horizontal sill by aligning DuPont FlexWrap edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.

C. Fan DuPont FlexWrap at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges.

D. Apply 9 inch wide strips of DuPont StraightFlash at jambs. Align flashing with interior edge of jamb framing. Start StraightFlash at head of opening and lap sill flashing down to the sill.

E. Spray-apply primer to top 6 inches of jambs and exposed sheathing.

F. Install DuPont FlexWrap at opening head using same installation procedures used at sill. Overlap jamb flashing a minimum of 2 inches.

G. Coordinate flashing with window installation.

H. On exterior, install backer-rod in joint between window frames and flashed rough framing. Apply sealant at jambs and head, leaving sill unsealed. Apply sealants in accordance with sealant manufacturer’s instructions and ASTM C1193.

I. Position weather barrier head flap across head flashing. Adhere using 4 inch wide DuPont StraightFlash over the 45-degree seams.

J. Tape top of opening in accordance with manufacturer recommendations.

K. On interior, install backer rod in joint between frame of windows and flashed rough framing. Apply sealant around entire opening to create air seal. Apply sealant in accordance with sealant manufacturer’s instructions and ASTM C1193.

3.6 FIELD QUALITY CONTROL

A. Notify manufacturer’s designated representative to obtain required periodic observations of weather barrier assembly installation.

3.7 PROTECTION

A. Protect installed weather barrier from damage.

B. Weather barrier shall be covered with exterior cladding materials prior to manufacturer’s recommended maximum exposure time.

END OF SECTION

SECTION 07 26 50

VAPOR EMISSION CONTROL SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Vapor emission control system for application over concrete slabs indicated to receive finished floor coverings.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 09 65 00 – Resilient Flooring.

C. Section 09 68 13 – Tile Carpeting.

D. Section 09 77 26 – Resinous Wall and Floor Surfacing.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
2. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials, Wet Method net perm rate (grains h-1 ft-2 in Hg-1).
3. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
4. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
5. ASTM F3010 – Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings.

1.4 SUBMITTALS

A. General: Submit under provisions of Division 01.

B. Submittal Requirements: Submit product data, independent third party testing laboratory test reports, certificates, and manufacturer’s standard warranty.

C. Submit concrete slab relative humidity and pH test results, performed and certified by a qualified independent testing agency.

D. Submit manufacturer's Certificate of Conformance stating that, per independent third party testing laboratory verification, the System installed on this project meets or exceeds all aspects of the standards set forth in ASTM F3010. Certificate shall be on manufacturer's letterhead and shall be signed by manufacturer.

1.5 DEFINITIONS

A. The System: Vapor emission control system specified in this Section referred to as "System" or "the System" in this Section for brevity.

1.6 QUALITY ASSURANCE

A. Qualifications:
   1. Installer Qualifications:
      a. Installer shall be either manufacturer's trained personnel; or manufacturer's factory-trained and certified installer.
      b. Installer shall have a minimum of five years' experience in the installation of specified vapor emission control system and shall have worked on a minimum of five installations using the same system.
   2. Manufacturer Qualifications:
      a. Minimum ten years' experience in manufacturing water vapor emission control systems, specifically formulated and used for reducing water vapor emissions, and alkalinity control in concrete slabs, without change of system formulation for a minimum period of five years at the time of application.
      b. Experience in product application in similar projects requiring vapor emission control at new and existing concrete slabs.
         1) Similar projects shall have documented success of system being installed at in-situ relative humidity of 98 percent or greater, when tested according to ASTM F2170.
      c. Manufacturer shall provide independent laboratory test reports documenting performance of the System as follows:
         1) Water Vapor Transmission (Water Method), ASTM E96: Performance of the System shall be documented by an independent testing laboratory. Test net perm rate results shall not exceed 0.11 grains h-1 ft-2 in Hg-1.
         2) Alkalinity Test, ASTM D1308: Insensitivity to alkaline environment up to pH 14 in a 14-day test with no effect or degradation of sample.
   3. Testing Agency Qualifications: Qualified and experienced independent testing agency or International Concrete Repair Institute (ICRI) accredited individual to perform relative humidity (RH) and pH tests, as specified in this Section.
   4. System Qualifications: The System shall meet or exceed all aspects of the standards set forth in ASTM F3010.

B. Environmental Requirements: The System shall meet applicable VOC requirements of authorities having jurisdiction at Project site.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver products to the job site in manufacturer's original unopened containers, clearly labeled with the manufacturer's name and brand designation.

B. Store products in a ventilated dry area, protected from dampness, freezing, and direct sunlight. Products shall not be stored in areas with temperatures in excess of 90 degrees F or below 50 degrees F, or with humidity in excess of 80 percent.

1.8 SITE CONDITIONS

A. Concrete Curing: The System shall be capable of being successfully installed on new concrete with a minimum curing period of seven days.

B. Enclosures and Environmental Limitations:

1. Prior to testing concrete slabs for vapor emission rates, building shall be fully enclosed, and weather-tight. Interior wet work shall be completed and nominally dry, and work above ceilings completed. Test sites shall be maintained at the same temperature and humidity expected during normal building use.
2. Concrete slabs shall be fully protected, with no water accumulation on the surface.
3. Do not apply the System when ambient temperature is lower than 50 degrees F or higher than 90 degrees F, or expected to fall below 50 degrees F or rise above 90 degrees F within 24 hours of the System application, or when ambient humidity level is above 80 percent. In addition, the surface temperature of the concrete shall be a minimum of 5 degrees F removed from dewpoint and rising.

1.9 WARRANTY

A. Provide manufacturer's written warranty for the System, covering system materials, testing, surface preparation, and installation. Additionally, warranty shall cover the cost of cementitious underlayment and floor covering repair or replacement, as acceptable to Owner and Architect, including, but not limited to, removal work, surface preparation, underlayment, floor covering materials, primers, adhesives, and associated installation work.

1. Warranty Period: Fifteen years, minimum, or the life of finished floor covering, whichever comes first.
2. Replacement Cost: In the event of failure of the System during warranty period, manufacturer's warranty shall cover all costs for removal and replacement work including the System and floor covering, up to $5,000,000 per occurrence.

B. Manufacturer's warranty exclusion shall be limited to the following:

1. System failure due to topical intrusion of water due to plumbing failure, or other substances entering from the surface.
2. Seismic damage occurring after installation.
3. Water intrusion including, but not limited to, plumbing or flooding leaks below the slab.
4. Damage due to removal and demolition work necessitated by replacement of installed floor covering during warranty period.

C. Warranty shall not exclude cracks visible at the time of installation or improper System installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Vapor Emission Control System:
   1. Acceptable Manufacturers and Products:
      a. Koster American Corporation, Virginia Beach, VA; phone: 757-425-1206; www.koesterusa.com. Products:
         1) Vap I® 2000 Zero VOC.
         2) LevelStrong SLU Self Leveling Underlayment.
         3) SC skim coat finish.
         4) Vap I 06 Primer.
      b. Ardex Engineered Cements, Aliquippa, PA; phone: 724-203-5000; www.ardex.com. Products:
         1) MC Rapid.
         2) Ardex cementitious underlayment products.
      c. Substitutions: Under provisions of Division 01.

B. Relative Humidity and pH Testing Supplies:
   1. Provide digital RH meter by one of the following or accepted equal:
      a. Rapid RH 4.0 Easy Reader with Smart Sensors by Wagner Electronics, Rogue River, OR; 800-634-9961, www.wagnermeters.com.
      b. Hygromaster with Hygrostik by GE Sensing, Goleta, CA; 800-472-6075, www.gesensing.com.
      c. TotalCheck RH Tester by Delmhorst Instrument Co., Towaco, NJ; 877-335-6467, www.delmhorst.com.
      d. Digital RH Meter: Relative Humidity Meter with probes and sleeves by American Moisture Test, Tustin, CA; 866-670-9700, americanmoisturetest.com.
   2. Provide digital pH meter by one of the following or accepted equal:
      a. Model PH100 ExStik® pH Meter by Extech Instruments Corporation, Nashua, NH; 877-239-8324, www.extech.com.
      b. Model #PH100 by Taylor Tools, Denver, CO; 303-371-7667, www.taylortools.com.
      c. AMT Concrete Digital Alkalinity-pH Meter by American Moisture Test, Tustin, CA; 866-670-9700, americanmoisturetest.com.
   3. Substitutions: Under provisions of Division 01.

2.2 SYSTEM DESCRIPTION

A. General: Vapor emission control system shall be warranted to control concrete slab relative humidity up to 100 percent as determined by:
   1. Site conditions.
   2. Concrete mix design.
   3. Age of concrete substrate.
   4. Relative humidity in the concrete slab.

5. pH test results.
6. Compatibility with finished floor covering products.

B. System Performance: Installed system shall bring pH levels within the range of 8-9, as determined by pH testing, in one or two coats at all areas indicated to receive a finished floor covering.

1. Water Vapor Transmission: ASTM E96 (Water Method); performance of the System shall be documented by an independent testing laboratory. Net perm rate results shall not exceed 0.11 grains h-1 ft-2 in Hg-1.
2. Relative Humidity Testing: ASTM F2170; the System shall perform as specified with relative humidity test results of 100 percent or less.
3. Alkaline Exposure Testing: ASTM D1308; insensitivity to alkaline environment up to pH 14 in a 14-day test.
4. Certified acceptance of exposure to continuous topical water exposure after final curing of the System.
5. Vapor emission control system shall be applied in one or two coats as required for full performance of System, and shall include a cementitious underlayment over the System for subsequent adhesion of floor covering.

C. System Materials: Two-component epoxy resin system, 100 percent solids, zero VOCs, containing specifically formulated chemicals and resins to provide the characteristics and properties specified in this Section. Epoxy systems containing water are not allowed.

D. Accessories: Concrete repair materials, underlayment, and primers used in conjunction with vapor emission control system shall be as recommended by or acceptable to the System manufacturer. Underlayment used over the System shall be acceptable to vapor emission control system, flooring adhesive, and floor covering manufacturers. Underlayment shall attain minimum 5,000 psi compressive strength at 28 days.

2.3 MIXING

A. Use clean containers and mix System components thoroughly, in accordance with manufacturer's printed instructions, to obtain a homogeneous mixture.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements and for other conditions affecting performance of the System.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.

C. Do not begin installation of the System until minimum seven day concrete curing and drying period has passed, after unsatisfactory conditions have been corrected, and after surfaces are dry.

3.2 CONCERTE SLAB TESTING

A. Testing Schedule: Testing shall be performed prior to application of the System.

1. Conduct tests at the same temperature and humidity expected during normal facility use. If this is not possible, the test conditions shall be 75 degrees F ±10 degrees F and 50 percent ±10 percent relative humidity. Maintain these conditions 48 hours prior to and during tests.
2. All relative humidity and pH test results shall be distributed to Contractor, Architect, and Owner.

B. Pre-Installation Testing: Perform pre-installation testing of concrete slab using relative humidity and pH tests prior to surface preparation for application of the System. Testing shall be performed by ICRI certified independent testing personnel and testing agency.

C. Installation contractor shall submit pre-installation checklist to the System manufacturer and written confirmation that the warranty will be enforced prior to beginning installation.

1. Concrete Testing: At new concrete slabs, confirm that proposed concrete curing methods are acceptable to System manufacturer prior to beginning curing procedures. Silicate based curing compounds are not allowed.
2. Relative Humidity Testing: Perform tests for relative humidity in the concrete slab per ASTM F2170. Perform three tests for the first 1,000 square feet and one test for each 1,000 square feet thereafter.
3. pH Testing: Perform three pH tests for the first 1,000 square feet and one test for each 1,000 square feet thereafter.

D. Post-Installation Testing:

1. After the System is installed, Owner may engage a testing agency to perform additional testing at Owner’s cost before installation of floor covering. Coordinate and schedule testing work with Owner’s testing agency. Number of tests shall be determined by the testing agency. Provide testing surfaces as required by Owner’s testing agency using ASTM E96 wet method test for net perms (grains h-1 ft-2 in Hg-1).
    a. Test floors for moisture by using the test method described in ASTM E96. Results shall be submitted to Architect for evaluation. When test results are above the allowable moisture emission specified for the intended floor covering materials, resolve the condition prior to installation of floor covering. Environment of all tests shall be the same during testing.
2. Adhesion Test: Perform adhesion compatibility test for flooring adhesives, coatings, and leveling compounds over completed vapor emission control system, as acceptable to Architect and Owner. Document and submit all adhesion test results to Architect and Owner.

3.3 PREPARATION

A. Prior to installation of System, all walls shall be masked or otherwise protected from the effects of scarification and System application.

B. Clean and prepare substrates according to the System manufacturer's written recommendations to produce clean, dust-free, dry substrate for the System application.

C. Remove silicate based floor hardeners or curing compounds from concrete slabs as recommended by the System manufacturer.

D. Remove defective materials, and foreign matter, such as, dust, adhesives, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, and laitance.

E. Cracks, control joints, and cold joints shall be prepared and treated in accordance with the System manufacturer's recommendations.

F. Clean and fill chips, voids and other surface irregularities with water resistant repair materials as recommended by System manufacturer.

G. Acid etching is not permitted.

H. Shot blast concrete surface to profile recommended by System manufacturer to ensure bonding of the System to concrete.

I. Concrete slabs to receive finished floor coverings shall conform to applicable requirements of ASTM F710.

J. Before application of the System, prepared surfaces shall be inspected by and acceptable to the System manufacturer's technical representative.

3.4 INSTALLATION

A. Install vapor emission control system in strict accordance with manufacturer‘s written instructions.

B. A leveling or trowel grade cementitious underlayment is required over completed vapor emission control system. Apply appropriate primer to the cured vapor emission control system, as recommended by the System manufacturer. Underlayment shall have adequate thickness to absorb any residual water from the flooring adhesive; thickness as recommended by the flooring/adhesive manufacturer.

3.5 FIELD QUALITY CONTROL

A. Any product testing to verify conformance to manufacturer's specifications shall be performed by taking unopened containers of product to an independent laboratory, with testing performed in accordance with the methods provided in manufacturer's technical literature.

3.6 CLEANING

A. Remove all debris resulting from the System installation from Project site.

3.7 PROTECTION

A. Protect installed vapor emission control system during curing period and prior to finished flooring installation from traffic, topical water, and surface contaminants.

END OF SECTION

SECTION 07 41 00

METAL WALL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preformed, prefinished metal siding system.

B. All trim, flashings, closures, fasteners, sealants, and other accessory items.

1.2 RELATED SECTIONS

A. Section 05 40 00 – Cold-Formed Metal Framing.

B. Section 07 25 00 – Weather Barriers.

C. Section 07 62 00 – Sheet Metal Flashing and Trim.

D. Section 07 92 00 – Joint Sealants.

E. Section 09 29 00 – Gypsum Board: Exterior sheathing.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy (Galvannealed) by the Hot Dip Process.
2. ASTM A792/A792M – Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
3. ASTM D1005 – Standard Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Metal Wall Panels:

1. Shop Drawings: Clearly show all pieces with all pertinent dimensions, layout, joints, expansion joints, construction details, methods of anchorage to support structure, flashings and trim, and interface with adjacent materials.

a. Provide design wind pressures and applicable zones around the building per requirements of 2022 CBC Section 1603.A.1.4.

C. Manufacturer's Data: Manufacturer’s descriptive data and specifications; include recommended installation and maintenance procedures.

D. Samples: Three 12 inch x 12 inch samples of each material, finish, and color specified.

E. Certificates: Manufacturer's certificates that materials meet specification requirements.

1.5 PERFORMANCE REQUIREMENTS

A. Movement: Accommodate movement within systems without damage to components or deterioration of seals, movement within system, movement between system and perimeter components when subject to seasonal temperature cycling, dynamic loading and release of loads, and deflection of structural support framing.

B. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel systems.

C. Thermal: Provide continuity of thermal barrier at building closure elements in conjunction with thermal insulating materials.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installation shall be by experienced mechanics directly employed by metal wall panel manufacturer or by erector currently licensed or franchised by panel manufacturer to erect projects of similar or greater complexity.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products under provisions of Division 01.

B. Provide adequate protection so material is not exposed to weather or moisture prior to erection.

C. Units of panels that become deformed or damaged from any cause whatsoever, to the extent that they are weakened or unsuitable for use as part of the finish surface, shall be replaced unless they can be repaired to the satisfaction of Architect.

D. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

E. Store pre-finished material off the ground, protected from weather to prevent twisting, bending or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

F. Prevent contact with dissimilar materials capable of causing corrosion, discoloration, or staining.

1.8 WARRANTIES

A. Immediately upon acceptance of metal panel work at the time of Final Project Completion, the Contractor, metal panel installer and metal panel manufacturer shall execute and deliver to Owner, the following Guarantees/Warrantees:

1. Twenty year unlimited Penal Sum Warrantee for material failure and finish failure (cracking, checking, blistering, peeling, flaking, chipping, chalking, and fading) by metal panel manufacturer for all panel systems specified in this Section.

2. Two year watertightness Guarantee/Warrantee by Contractor and Metal Panel Installer warranting panels, flashings, sealants, fasteners and accessories against defective materials and workmanship, to remain watertight and weatherproof:

   a. Emergency repairs shall be made within 24 hours' notice by Owner of leakage or defect. As soon as weather permits, affected areas shall be permanently restored to standards of quality, i.e. workmanship, durability and appearance called for in the Contract Documents. Emergency repairs shall be made without any charge to the Owner. The value of this Agreement shall not be limited to a specific maximum sum. Owner maintenance shall not be required as a condition to continuation of this Agreement in force for two years.

   b. Excluded from this Agreement are leaks or defects caused by abuse, vandalism, extraordinary wall movement, fire or other casualty. This agreement binds the undersigned and any of their agents, successors, legal representatives or assigns during the life of the Agreement.

B. Warranty includes removal, replacement, repair, and making good without cost to the Owner, of defects due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Basis-of-Design: AEP Span, West Sacramento, CA; 800-733-4955, www.aepspan.com. Products:
   a. Flex Series 1.2FX40-12 and 1.2FX20-12.
   b. IAPMO #ER-0309.
2. MBCI, Atwater, CA; 800-829-9324, www.mbci.com.
3. Carlisle Metal Products, Carlisle, PA; 800-479-6832, www.carlislemetalproducts.com.
4. Metal Sales Manufacturing Corporation, Louisville, KY; 800-406-7387, www.metalsales.us.com.
5. Morin, a Kingspan Group Company, Bristol, CT; 800-640-9501, www.morincorp.com.
6. Firestone Metal Products LLC, Anoka, MN; 800-426-7737, www.firestonemetal.com.

B. Substitutions: Under provisions of Division 01.

2.2 SIDING PANEL SYSTEM

A. Pre-finished panels shall be fabricated of 22 gauge galvanized steel in full lengths as shown on the Drawings. Panels shall have a depth of 1-1/4 inches and have a 12 inch wide net coverage. Individual panels shall be removable for replacement of damaged material.

2.3 SIDING PANEL MATERIALS

A. Base metal shall be 22 gauge steel with 1.9 mil thick Zincalume protective coating conforming to ASTM A792.

B. Flashings, trims, reveals, and all other items, unless otherwise indicated on the Drawings, shall be pre-finished to match siding panels and shall be furnished and installed hereunder. All items shall conform to ASTM A792, 22 gauge, unless indicated otherwise.

C. Fasteners, clips, etc., shall be corrosion-resistant type as recommended by the manufacturer to provide a complete concealed anchorage system and to ensure a water and weatherproof installation.

1. All exposed fasteners shall have neoprene washers.

2.4 FABRICATION

A. Form sections to configuration indicated on the Drawings, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest practical lengths.

2.5 FINISH

A. Factory Finish:

1. Exposed Face: Dura Tech 5000 Polyvinylidene Fluoride (PVDF) paint system consisting of a baked-on 0.2 mil thick corrosion-resistant primer and a baked-on 0.8 mil thick finish coat containing 70 percent Kynar 500/Hylar 5000 resins for total coating of 1.0 mil dry film thickness.
2. Concealed Face: Corrosion-resistant primer coat with 0.15 mils dry film thickness and finish coat of polyester paint with 0.35 mils dry film thickness for total coating of 0.50 mil dry film thickness.
3. All dry film thickness measurements shall be in accordance with ASTM D1005.

B. Color as indicated on Drawings.

2.6 SEALANTS

A. As recommended by the manufacturer and complying with the requirements of Section 07 92 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify supporting substrate surfaces are ready to receive panel system. Surfaces in contact with panels shall be free from debris or objects that may damage panels.

B. Do not proceed with installation until all conditions are satisfactory.

3.2 INSTALLATION

A. Workmanship: All work shall be neat, trim, true to line and, upon completion, shall present a true finished surface of the specified profile, free of dents, deformations, creases or other noticeable defects.

1. The completed installation shall provide an installation with all seams aligned and straight.

B. Installation of siding panel anchorage and all accessories shall be in strict accordance with manufacturer's standard instructions and approved shop drawings.

1. Remove any strippable protective coating on the panels and flashings prior to installation and in any case do not allow the strippable coating to remain on the panels in extreme heat, cold or in direct sunlight or other UV source.
2. Panels shall be attached to substrate with clips and fasteners as indicated on approved shop drawings.
3. Sheets shall be installed with approved side lap.
4. Flashings and trim pieces shall be attached with mechanical fasteners and sealant as per manufacturer's recommendations or as indicated on the Drawings.
5. There shall be no perforation of the panels except as required for anchoring and installation of trim members. Exposed fasteners shall be stainless steel. Screws shall have hot bonded neoprene washers.

3.3 ERECTION TOLERANCES

A. Maximum offset from indicated alignment between adjacent members butting or in line: 1/16 inch, non-cumulative.

B. Maximum variation from plane or location indicated on the Drawings: 1/4 inch.

3.4 ADJUST AND CLEAN

A. Cleaning and Finishing: Upon completion of the work clean all exposed surfaces with mild soap and water, removing any discoloration or foreign matter. Touch up all abraded or cut areas and exposed edges with finishing material recommended by the manufacturer. Touch-up shall not be obvious.

B. Defective Work: Remove and replace any defective work which cannot be properly repaired, cleaned or touched up, as directed by the Architect, with no additional cost to the Owner.

C. Protect all installed work against damage from other construction work.

3.5 CLEAN UP

A. Upon completion of the work of this Section, remove all surplus materials, rubbish and debris from the premises.

END OF SECTION

SECTION 07 54 23

THERMOPLASTIC-POLYOLEFIN ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Adhered thermoplastic polyolefin (TPO) roofing membrane system.

B. Gypsum roof cover board.

C. Roof insulation.

D. Walkway membrane (Traffic Pads).

E. Roofing accessories.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 05 31 00 – Steel Decking.

C. Section 07 62 00 – Sheet Metal Flashing and Trim.

D. Section 07 72 33 – Roof Hatches.

E. Section 08 62 00 – Unit Skylights.

F. Divisions 21-23 – Mechanical.

G. Divisions 26-28 – Electrical.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards and Manuals:

1. ASTM C209 – Standard Test Methods for Cellulosic Fiber Insulation Board.
2. ASTM C1177/C1177M – Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
3. ASTM C1289 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
4. ASTM C1371 – Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.

5. ASTM C1549 – Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
6. ASTM D471 – Standard Test Method for Rubber Property – Effects of Liquids.
7. ASTM D751 – Standard Test Methods for Coated Fabrics.
8. ASTM D1204 – Standard Test Method for Linear Dimensional Changes of Non-Rigid Thermoplastic Sheathing or Film at Elevated Temperature.
9. ASTM D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
10. ASTM D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics.
11. ASTM D2126 – Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
12. ASTM D5884 – Standard Test Method for Determining Tearing Strength of Internally Reinforced Geomembranes.
13. ASTM D6878 - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.
14. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
15. ASTM E96 – Standard Test Method for Water Vapor Transmission of Materials.
16. ASTM E108 – Standard Test Methods for Fire Tests of Roof Coverings.
17. ASTM E408 – Standard Test Method for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
18. ASTM E1980 – Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
19. Factory Mutual Global (FMG) Approval Guide.
20. NRCA – National Roofing Contractors Association.
21. UL 790 – Standard Test Methods for Fire Tests of Roof Coverings.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data:

1. Submit manufacturer’s descriptive literature, product specification, and installation instructions for each product.
2. Material Safety and Data Sheet (MSDS) for each product.

C. Shop Drawings:
   1. Insulation Setting Plan.
      a. Include layout of regular and tapered rigid insulation system showing identification of each insulation board, sequence of laying boards, all roof slopes, and thickness of insulation.
   2. Single-Ply Roofing Membrane Setting Plan: Include layout of membrane, location of flashings and accessories.
   3. Detail Drawings: Include joint or termination detail conditions, such as junction at deck and wall, curb flashing, roof drain, pre-molded pipe flashing, field fabricated pipe flashing, field fabricated hot pipe flashing, parapet flashing, inside corner and outside corner flashing, sealant pockets, and scuppers.

D. Samples:
   1. 48 inch by 96 inch roofing assembly illustrating roofing membrane, cover board, rigid insulation, roof deck substrate, and adhesion system.
   2. Walkway pads.

E. Quality Assurance Submittals:
   1. ICC ES Report.
   2. Manufacturer's Field Reports: Submit under provisions of Division 01.
   3. Manufacturer Certifications.
   4. Installer Certifications.

F. Closeout Submittals:
   1. Warranty certificate.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Provide insulation, cover board, membrane, and accessory materials from a single manufacturer to ensure system compatibility and quality, and to comply with manufacturer's warranty requirements.

B. Qualifications:
   1. Manufacturer Qualifications:
      a. Firm specializing in roofing systems specified in this Section with a minimum ten years documented experience.
      b. Furnish qualification documentation including a complete list of all projects (minimum of ten) within a 100-mile radius from project site, with the same climate zone, using the same roofing system, and single-ply membrane formulation/ingredients. Include information on project location, size (square feet), date of installation, and contact information.
      c. Private-labeled single-ply membrane products are not acceptable.
   2. Installer Qualifications:
      a. Firm specializing and certified by roofing system manufacturer. Submit manufacturer's certification at time of bid.
      b. Minimum of three years' experience in single-ply roofing installation.
      c. State Contractor's License: Class C-39.

C. Regulatory Requirements:

1. Conform to the 2022 CBC, Section 1505 for roof assembly fire classification requirements.
2. Roof Assembly Fire Hazard Classification: UL Class A per ASTM E108 or UL 790.
3. All roof surfaces shall have positive roof drainage per definition in CBC Section 1502 and shall meet or exceed the minimum slope of 1/4 inch per foot as described in CBC Section 1507.12.1. Refer to Drawings for roof slopes and drainage patterns.
4. Thermoplastic single-ply roof covering shall comply with ASTM D6878 per CBC Section 1507.12.2.
5. Wind Uplift: Per CBC Section 1609.5.2, roof coverings shall be designed to withstand the wind pressures at the location of this Project, determined in accordance with ASCE 7.
    a. Per CBC Section 1504.4, the wind load on the roof covering shall be permitted to be determined using allowable stress design.

D. Certifications:

1. Manufacturer Certification: Certify that the specified or proposed roofing system including type of deck, insulation, gypsum roof cover board, membrane type, attachment or adherence of components, perimeter attachment details, and all system component details are acceptable to meet warranty requirements and, when installed as per FMG Approval Guide, it will meet or exceed Factory Mutual System Approval and UL Classification Requirements as per UL RMSD.
2. Manufacturer's Acceptance of Roofing Installer: Certify that the roofing installer's qualifications have been reviewed, meet requirements of this Section, and is accepted by the roofing manufacturer.

E. Pre-Installation Meetings:

1. Conduct pre-installation meeting in accordance with Division 01.
2. Convene pre-installation meeting at the site at least one week prior to commencing work on this Section.
    a. Attendees:
        1) Owner's representative, preferably including Owner's Facilities Manager and Maintenance Foreman.
        2) Architect.
        3) Contractor.
        4) Roofing installer.
        5) Related trades sub-contractors.
        6) Manufacturer Technical Representative/Inspector.
    b. Agenda:
        1) Review roof design (roof substrate, roofing system, flashings, etc.), shop drawings, and submittals.
        2) Review manufacturer's installation and technical information and provisions of this Section.

3) Review substrate requirements including substrate preparation and procedures for inspection and handover to roofing installer.

4) Review and coordinate schedule and site conditions related to project and work of this Section.

5) Conduct a roofing substrate walk-through.

3. Contractor shall give a minimum one-week notice to pre-installation meeting participants.

F. Coordination: Coordinate the work in this Section with work in related Sections particularly roof substrate work. Convene a coordination meeting at least one week before roof substrate work with roof system manufacturer's representative attending and in accordance with Division 01.

1.6 SUSTAINABLE BUILDING DESIGN REQUIREMENTS

A. Provide highly reflective Energy Star compliant roofing system with emissivity of at least 0.9 when tested in accordance with ASTM E408 for a minimum of 75 percent of the roof surface.

1. Thermal Emissivity shall be measured in accordance with ASTM C1371.
2. Solar Reflectivity shall be measured in accordance with ASTM C1549.
3. Solar Reflectance Index shall be measured in accordance with ASTM E1980.

B. Provide insulation products manufactured free from environment-harmful blowing agents chlorofluorocarbon (CFC) and hydrochlorofluorocarbon (HCFC).

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Store products in weather protected environment, clear of ground and moisture.

D. Store insulation and cover board dry and protected from the elements. Store insulation on pallets and completely cover with a breathable material such as tarp or canvas. Remove or slit temporary factory-applied packaging to prevent accumulation of condensation. Do not use wet or damaged insulation.

E. Store roofing membrane in the original undisturbed plastic wrap.

F. Store adhesives, sealants, and other curable materials in cool and dry location with temperatures between 60 degrees F and 90 degrees F. Do not store adhesive containers with opened lids due to the loss of solvent which occur from flash off.

1.8 PROJECT/SITE CONDITIONS

A. Do not apply roofing system during inclement weather.

B. Do not apply roofing system to damp or frozen substrate.

C. Take precautions to prevent wind blow-off or wind damage during the course of the roofing application.

D. Substrates to receive roofing system shall be thoroughly dry. Provide drying equipment should moisture occur.

1.9 WARRANTY

A. Comply with provisions of Division 01.

B. Warranty installed membrane roofing system including labor and materials for loss of water-tightness caused by defective materials (including accessories) or workmanship, with no dollar limit, for twenty years. Effective warranty start date shall be at the time of final acceptance by Owner.

C. Warranty shall provide for the removal, replacement, repair, and making good without cost to Owner, of defects due to defective materials or workmanship.

D. Repairs under warranty shall be made within three days after receiving notice of need for repairs from Owner, weather permitting.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Acceptable Manufacturers and Products:
   1. TPO Roofing Membrane System:
      a. Carlisle Syntec Inc. Product: Sure-Weld FleeceBACK 115 system.
         1) Flexible FAST adhesive for use on rigid insulation and gypsum cover board.
         2) CAV-GRIP III Low-VOC Adhesive/Primer for use on roofing membrane.
      b. GAF Materials Corp.
      c. Johns Manville.
   2. Gypsum Cover Board: Provided by roof system manufacturer.
   3. Roof Insulation: Provided by roof system manufacturer.

B. Substitutions: Under provisions of Division 01.

2.2 TPO ROOFING MEMBRANE

A. Ultraviolet resistant thermoplastic polyolefin membrane reinforced with polyester fabric.

B. Properties:
   1. Membrane Composition and Thickness (ASTM D751): 60 mil TPO membrane laminated to 55 mil non-woven polyester fleece backing; total thickness of 115 mils.
   2. Tolerance on nominal thickness: ± 10 percent.
   3. Minimum breaking strength (ASTM D751): 400 lbf.
   4. Elongation at break of fabric (ASTM D751): 25 percent.
   5. Minimum tearing strength (ASTM D751): 130 lbf.
   6. Dimensional stability (ASTM D1204): ± 0.2 percent.
   7. Water absorption (ASTM D471): ± 2 percent.
   8. Color: White.
      a. Initial Solar Reflectance: 0.79.
      b. Initial Thermal Emittance: 0.90.
      c. Solar Reflectance Index: 99.

2.3 GYPSUM ROOF COVER BOARD

A. Glass mat-faced, noncombustible, moisture-resistant treated gypsum core panel specifically designed for roofing applications, 1/4 inch thick, 1/2 inch thick, or 5/8 inch thick where indicated on Drawings, square edges, factory primed, conforming to ASTM C1177.

1. Where membrane is attached to gypsum roof cover board with adhesive (such as at vertical surfaces), and where used between metal deck and vapor barrier, cover board shall be factory primed and 5/8 inch thick. Do not use products intended for use as exterior wall sheathing.

2.4 ROOF INSULATION

A. Rigid, closed-cell polyisocyanurate foam core integrally laminated to heavy black (non-asphaltic), fiber-reinforced felt facers; square edges. Comply with ASTM C1289, Type II, Class 1, Grade 2; ICC ES Listed; UL Listed.

1. Properties:
    a. Compressive strength (ASTM D1621): 20 psi minimum.
    b. Product density (ASTM D1621): 2.0 pounds per cubic foot minimum.
    c. Water absorption (ASTM C209): Less than 1.5 percent by volume.
    d. Surface burning characteristics (ASTM E84):
        1) Flame spread: Less than 75.
        2) Smoke developed: Less than 450.
    e. Long-term thermal resistance (LTTR) value (CAN/ULC-S770): Minimum 5.7 F·hr·SqFt / Btu / inch at 75 degrees F.
    f. Water vapor permeance (ASTM E96): 1.5 perms maximum.
    g. Dimensional stability (ASTM D2126): 2.0 percent linear change maximum.
    h. Thickness: As indicated on Drawings.

B. Place insulation over entire area scheduled to receive single ply roofing.

1. Crickets shall be fabricated from polyisocyanurate insulation; tapered.

C. Insulation shall be tapered where indicated on Drawings.

2.5 ACCESSORIES

A. Non-Reinforced or Reinforced TPO Flashing, Pipe Boot and Flashings, Clamping Rings: Use roofing membrane provided and recommended by manufacturer.

B. Flashing Metal: 0.023 inch thick galvanized steel laminated to 0.020 inch thick roofing membrane in white color used for flashing and edge metal detailing as furnished by the membrane manufacturer.

C. Membrane Bonding Adhesive: Low-VOC, methylene chloride-free aerosol contact adhesive/primer meeting California Air Resources Board or local Air Pollution Control/Air Quality Management District regulations.

D. Adhesive for Insulation and Gypsum Roof Cover Board Attachment for Adhered Single-Ply Roofing System: Two-component, low-rise adhesive approved by roofing system manufacturer and cover board and insulation manufacturers.

E. Termination Bar: Extruded aluminum bar 0.08 inch thick by 1 inch wide.

F. Membrane Cleaning Solution: Manufacturer approved or recommended.

G. Air and Vapor Barrier: Roofing manufacturer's 40 mil composite air and vapor barrier consisting of 35 mils of self-adhering rubberized asphalt laminated to a 5 mil polyolefin film with a siliconized one piece release liner. Permeability: 0.05 perms per ASTM D1970.

1. Primer: Type as manufactured and recommended by roofing manufacturer, appropriate to substrate.

H. Sealants: Refer to Section 07 92 00. Solvent-based ethylene propylene seam caulk approved by roofing system manufacturer.

I. All-Purpose Sealant: Single component, high-solids content, and gun grade, approved by membrane manufacturer.

J. Walkway Rolls: 34 inches wide, 170 mils thick heat-weldable TPO material as supplied by membrane manufacturer, color: white. Verify manufacturer's standards for walkway pad design and slip-resistance with Architect prior to procurement of pads and prior to submittal of shop drawings.

K. Safety Zone Markings: Roofing manufacturer's 12 inch wide yellow coverstrip consisting of 30 mil thick non-reinforced TPO flashing laminated to a nominal 30 mil thick, fully cured synthetic rubber pressure sensitive adhesive.

L. Wood Nailers: Continuous fire retardant treated wood.

PART 3 EXECUTION

3.1 EXAMINATION

A. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected and only when substrate is inspected and accepted by roofing installer and roofing system manufacturer.

B. Verify that surfaces and site conditions are ready to receive work.

C. Verify that deck is structurally sound to secure adhered single ply roofing system. Inspect roof deck for corrosion, rotting, warping, concrete spalling, etc. Repair or replace defective roof deck prior to installing the roofing system.

D. Verify that deck surfaces are dry to the touch and free of snow or ice.

E. Verify that deck is clean and smooth, free of noticeable high spots or depressions, and has a positive slope to drains or valleys.

F. Concrete shall be in place for 28 days minimum prior to adhered roofing system installation. Contractor shall verify that concrete decks are dry and exhibit negative alkalinity, carbonization, or dusting. The concrete relative humidity and alkalinity tests shall be performed per ASTM F2170 and ASTM D1308 respectively, and shall be documented prior to installation of roofing system. When concrete relative humidity and alkalinity test results exceed the values specified below, contact Architect for direction.

1. Maximum Relative Humidity of Concrete: 75 percent.
2. pH Range: 8 to 9.

G. Verify that roof openings, curbs, pipes, sleeves, ducts, vents, etc. through roof are solidly set. Verify and ensure that all roof drain lines are clear.

3.2 PREPARATION - GENERAL

A. Protection: Protect roofing surface and adjacent work against damage to roofing work.

B. Review Material Safety Data Sheet and safety regulations recommended by OSHA.

C. Wood Nailers:

1. Install fire retardant treated wood nailers in appropriate size and location when required by the membrane manufacturer for a warrantable system.
2. Anchor to the roof deck at two feet on center maximum to resist a pullout force of 175 pounds per foot in any direction. Install fasteners within 6 inch of each end. Spacing and fastener embedment shall conform to Factory Mutual Loss Prevention Data Sheet 1-49.
3. Top of nailers shall be flush top of roof insulation.

D. Preparation Of Substrate:

1. General: To prevent delays or interruptions, coordinate with other work to ensure that components to be incorporated into the roofing system are available as the work progresses. Examine substrates to which the roofing materials are to be applied to ensure that their condition is satisfactory for the roofing systems application. Do not permit voids greater than 1/4 inch width in the substrate. Substrates for roofing materials shall be dry and free of oil, dirt, grease, sharp edges and debris. Inspect substrates and correct defects before application of roofing membrane.
2. Determine the condition of the structural substrate. Areas with deteriorated or damaged decking or other materials shall have those affected materials removed and replaced.
3. Provide temporary water cut-offs at the end of each day. Maintain watertight condition of roof to prevent water intrusion. Install only that amount of roofing and flashing that can be made watertight with new materials in a one-day period or prior to the onset of inclement weather. Remove cut-off before resuming roofing.
4. Cover concrete and metal decking substrates with rigid insulation and cover board, applied in accordance with manufacturer’s instructions and as required resulting in a UL Class A roof system.

3.3 AIR AND VAPOR BARRIER INSTALLATION

A. Prepare concrete surfaces and install primer and air and vapor barrier per manufacturer’s recommendations.

1. Surfaces shall be clean, dry, smooth, and free of voids, spalled areas, sharp protrusions, loose aggregate, laitance, and curing and form release compounds.
2. Concrete shall be in place for 28 days minimum prior to barrier installation.

B. Install air and vapor barrier over entire roof area and at all roof penetrations and deck to wall intersections per manufacturer’s standard details for each condition.

1. Installation Substrates:
   a. Concrete.
   b. Gypsum roof cover board.

3.4 INSULATION INSTALLATION

A. Place insulation over clean roof deck where indicated on Drawings in accordance with manufacturer's instructions.

B. Install insulation in thickness indicated on Drawings. Install additional thickness as required to meet requirements indicated on Drawings.

C. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

D. Apply no more insulation than can be covered with cover board and membrane in same day.

E. Tape joints of insulation in accordance with insulation manufacturer's instructions.

F. Stagger all joints when multiple layers of insulation are being installed.

G. Apply adhesive for adhered single-ply roofing system according to adhesive manufacturer's instructions.

3.5 GYPSUM ROOF COVER BOARD INSTALLATION

A. Place cover board over clean insulation.

B. Stagger all joints a minimum of 6 inches from underlying insulation joints.

C. Apply adhesive for adhered single-ply roofing system according to adhesive manufacturer's instructions.

3.6 ROOFING MEMBRANE PLACEMENT, ATTACHMENT, AND HOT AIR WELDING

A. General: Install membrane in accordance with manufacturer's instructions.

B. Sweep substrate of all loose debris before laying membrane.

C. Adhered Single-Ply Roofing System:

1. Apply adhesive per manufacturer's foam adhesive bead spacing requirements within the field, at perimeters, and at corners to meet wind uplift and warranty requirements.
2. Position membrane over the substrate.
3. Fold membrane sheet back so half the underside is exposed.
4. Stir bonding adhesive thoroughly scraping the sides and the bottom of the can (5 minutes minimum). Bonding surfaces must be dry and clean.
5. Apply bonding adhesive to the exposed underside of the membrane and the corresponding substrate area. Do not apply adhesive along the splice edge of the membrane to be hot air welded over adjoining sheet.
6. Apply adhesive evenly, without puddles using a plastic core medium nap roller to achieve continuous coating of both surfaces at a coverage rate recommended by adhesive manufacturer.
7. Due to solvent flash-off, condensation may form on freshly applied bonding adhesive when the ambient temperature is near the dew point. If condensation develops, possible surface contamination may occur and the application of bonding adhesive must be discontinued. Allow the surface to dry and apply a thin freshener coat to the previously coated surface when conditions allow for continuing.

8. Allow adhesive to dry until it is tacky but will not string or stick to a dry finger touch.
9. Roll the coated membrane into the coated substrate while avoiding wrinkles.
10. Brush down the bonded section of the membrane sheet immediately after rolling the membrane into the adhesive with a soft bristle push broom to achieve maximum contact.
11. Fold back the unbonded half of the sheet in the same manner, overlapping edges a minimum of 2 inches to provide for a minimum of 1-1/2 inch hot air weld.
12. Install adjoining membrane sheets in the same manner, overlapping a minimum of 2 inches to provide a minimum of 1-1/2 inch hot air weld.
13. Protect completed sections of the roof so bonding adhesive will not discolor the membrane surface. Do not place bonding adhesive containers or their lids directly on the surface of the membrane.
14. Install additional membrane securement at the perimeter of each roof level, roof section, curb, skylight, interior wall, etc. at any inside angle change where slope exceeds 2 inches in one horizontal foot. Use manufacturer approved fasteners and standard seam fastening plates installed horizontally or vertically at the base of the walls, curbs, etc., spaced a minimum of 12 inches on center and flashed as recommended by roofing system manufacturer.

D. Adhered Single-Ply Roofing System at Vertical Surfaces:
   1. Apply the applicable bonding adhesive to the exposed underside of the membrane and the corresponding vertical substrate area at the published application rate on the applicable Product Data Sheet.
   2. Allow adhesive to dry until tacky and install coated membrane into coated vertical substrate and avoid wrinkling.
   3. Brush down the bonded section of membrane immediately with a soft bristle push broom.
   4. Install adjoining membrane sheets in the same manner, overlapping edges a minimum of 2 inches to provide for a minimum 1-1/2 inch hot air weld. All splices be shingled to avoid bucking of water.
   5. Hot air weld the membrane sheets a minimum of 1-1/2 inches with an automatic hot air welding machine.

E. Welding of Laps:
   1. General:
      a. Roofing membrane connection shall be hot air welded only.
      b. Surfaces to be welded shall be clean and dry.
   2. Hot Air Welding:
      a. Hot air weld the membrane sheets with an automatic hot air welding machine. Follow hot air welding machine manufacturer’s instructions for use.
      b. Where use of automatic hot air welding machines is not practical, use a hand-held hot air welding machine. Preheat the nozzle tip and apply over the overlap area until the material reaches required temperature, immediately follow with a hand roller to press the heated membrane surfaces together with slow, even movements. Keep the roller within one inch of the nozzle tip. Seam strength may be tested when cool. For best results, test seams 8 hours after hot air welding.

3. Quality Control of Seams: After seaming, check welded seams for continuity and integrity. Repair openings or “fishmouths” with a hand-held hot air tool fitted with a narrow nozzle tip and with a roller.
4. Membrane lap edges that have been exposed to the elements for approximately seven days or longer must be prepared with manufacturer-approved membrane cleaner. Prepare the surface where the cleaner has been applied as per manufacturer’s instructions prior to hot air welding.

3.7 MEMBRANE FLASHING

A. Flash all vertical surfaces with reinforced membrane. Use non-reinforced membrane only at inside and outside corners, field fabricated pipe seals, scuppers, and sealant pockets where the use of premolded accessories are not practical. Terminate the flashing in accordance with manufacturer-approved detail.

B. Use bonding adhesive on vertical surfaces more than 12 inches high such as walls, curbs, and pipes. Bonding adhesive is not required for vertical surfaces terminated under a metal counter flashing less than 12 inches high. Bonding adhesive may be eliminated for flashing heights 18 inches or less when a coping or termination bar is used for vertical terminations.

3.8 OTHER RELATED WORK

A. Walkways: Install walkway pads per manufacturer’s recommendations in the locations indicated on Drawings. Position the walkway material. Cut the walkway rolls into maximum 10-foot lengths and position with a minimum 1-inch gap between adjacent pieces to allow for water drainage. Cut the walkway so a 4-inch minimum gap is created over any field membrane seams/splices.

B. Safety Zone Markings: Install safety zone markings as recommended by the manufacturer in the locations indicated on Drawings.
1. Clean roofing membrane with manufacturer’s membrane cleaner.
2. Roller apply manufacturer’s low-VOC TPO primer. Install coverstrip immediately after primer flashes off.
3. Peel off a length of protective release liner from coverstrip. Position coverstrip and press down using firm, even hand pressure across the entire area.
4. Immediately roll coverstrip with silicone or steel roller using positive pressure. Roll across coverstrip edge, not parallel to the length.

C. Copings, Counterflashing, and Other Metal Work: Refer to Section 07 62 00. Fasten flashing to prevent metal from pulling free or buckling. Seal to prevent moisture from entering the roofing system or building.

3.9 FIELD QUALITY CONTROL

A. General: Comply with requirements of Division 01.

B. The manufacturer’s representative shall observe, conduct tests, and prepare test reports in accordance with the provisions of this Section at predetermined periods before, during, and after installation of the work – specifically at critical periods identified by roofing system manufacturer to ensure a completely warranted system.

C. The manufacturer's representative and the testing agency shall conduct final roof inspection on completion of the work in this Section and submit report to Architect and Owner. Notify Architect and Owner 48 hours in advance of date and time of inspection.

3.10 CLEANING

A. Clean roof surfaces as recommended by manufacturer. Do not use materials or methods which may damage surface or surrounding construction.

B. Where traffic must continue over finished roof membrane, protect surfaces.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior wall flashings.

B. Roof flashings.

C. Gutters.

D. Pre-manufactured copings.

E. Pre-manufactured roof penetration flashings.

F. Reglets.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 07 54 23 – Thermoplastic-Polyolefin Roofing.

C. Section 07 92 00 – Joint Sealants.

D. Section 08 91 19 – Fixed Louvers.

E. Section 09 91 00 – Painting.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. AAMA 2605 – Voluntary Specifications, Performance Requirements, and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
2. ANSI/SPRI/FM4435/ES-1 – Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.
3. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc Coated, (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. ASTM B32 – Standard Specification for Solder Metal.
5. ASTM D1187 – Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

6. ASTM D4586 – Standard Specification for Asphalt Roof Cement, Asbestos Free.
7. NRCA Roofing Manual.
8. SMACNA Architectural Sheet Metal Manual.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Describe material profile, jointing pattern, jointing details, fastening methods and installation details.

C. Samples: Provide two-12 inch long samples of premanufactured reglets and coping in selected color.

1.5 QUALITY ASSURANCE

A. Applicator: Company specializing in sheet metal flashing work with sufficient documented experience.

1.6 SYSTEM DESCRIPTION

A. Work of this Section is to physically protect roofing and exterior from damage that would permit water leakage to building interior.

1.7 PERFORMANCE

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 degrees F, ambient; 180 degrees F, material surfaces.

1.8 DELIVERY, STORAGE AND HANDLING

A. Store products under provisions of Division 01.

B. Stack preformed material to prevent twisting, bending or abrasion, and to provide ventilation.

C. Prevent contact with materials during storage that may cause discoloration, staining or damage.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, G90 zinc coating; 24 gauge core steel unless noted otherwise on Drawings.

2.2 ACCESSORIES

A. Fasteners: Galvanized steel or stainless steel with soft neoprene washers. Finish exposed fasteners same as flashing metal.

B. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187.

C. Touch-up Paint: "Galvalloy" or "Galvweldalloy."

D. Sealant: Type specified in Section 07 92 00.

E. Bedding Compound: Rubber-asphalt type.

F. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

G. Solder:

1. Galvanized Steel: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead with maximum lead content of 0.2 percent.

H. Flux: Type as recommended by sheet metal manufacturer.

2.3 PREMANUFACTURED COPINGS

A. Manufacturers:

1. Hickman Edge Systems. Product: PermaSnap Premier Plus Coping.
2. Tremco.
3. Metal Era.
4. Permatite.
5. Substitutions: Under provisions of Division 01.

B. Copings: Modular Coping System.

1. System shall comply with ANSI/SPRI/FM4435/ES-1 design criteria.
2. Coping shall be 0.050 inch thick aluminum with smooth surface.
3. Sizes as required to accommodate varying wall thicknesses.
4. Splice joints shall have 6 inch long concealed splice plates at 12 feet on center. Allow 1/4 inch at all butt joints per 12 foot length.
5. Provide prefabricated corners, tees, and ends; shop welded.
   a. Corners and tees shall be shop mitered.
6. All fasteners shall be concealed.
7. Finish: Pre-finished with Kynar 500 three coat paint system in conformance with AAMA 2605, color as selected by Architect.

2.4 PREMANUFACTURED ROOF PENETRATION FLASHINGS

A. At single ply membrane roofing:

1. Products as manufactured by Portals Plus or accepted equal.

a. Pipe Portal Systems Pipe Boots: Compression molded EPDM rubber caps mechanically sealed to curb cover using two beads formed into the collar of the cover mated with double grooves molded into the inside of the cap. Provide manufacturer's standard adapter rings as required for a watertight installation. Size and type: As required for size and number of pipes to be flashed.

1) Provide stainless steel clamps for final securement of pipe boots around penetrations.

2.5 REGLETS

A. Manufacturers:

1. Fry. Products:

a. Masonry Flashing System: Fry Reglet Model "MA" Springlok Masonry Reglet and Counter Flashing with 1-1/2 inch top flange. Material shall be 0.025 inch thick aluminum with gray polyester coating.

2. MM Systems.

3. Superior.

B. Substitutions: Under provisions of Division 01.

2.6 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats and starter strips of same material as sheet, interlockable with sheet.

C. Form pieces in longest practical lengths.

D. Hem exposed edges on underside 1/2 inch; miter and seam corners.

E. Form material with flat lock seam.

F. Solder and seal non-moving metal joints watertight. After soldering, remove flux. Wipe and wash solder joints clean.

G. Fabricate one piece corners with minimum 18 inch long legs; seam for rigidity, solder joint watertight.

H. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

I. Expansion-contraction of sheet metal runs: Provide flat, 4 inch lap joints, sealed watertight with sealant, at maximum of 40 foot intervals.

2.7 FINISHES

A. Back-paint concealed metal surfaces with bituminous paint to a minimum dry film thickness of 15 mils.

B. Site paint finish under provisions of Section 09 91 00.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify shapes and dimensions of surfaces to be covered.

B. Verify substrates are clean, dry, smooth and free of defects to the extent needed for sheet metal work.

C. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Field measure site conditions prior to fabricating work.

B. Install starter and edge strips, and cleats before starting installation.

C. Install reglets true to lines and levels. Seal top of surface mounted reglets with sealant.

D. Insert flashings into reglets to form tight fit. Secure in place with plastic wedges at maximum 12 inches on center. Seal flashings into reglets with sealant.

E. Secure flashings in place using concealed fasteners. Use exposed fasteners only in locations acceptable to Architect.

F. Lock and seal all joints.

G. Apply plastic cement compound between metal flashings and felt flashings.

H. Apply bituminous coating between dissimilar metals.

I. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

J. Solder non-moving metal joints watertight for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.

K. Seal metal joints watertight.

L. Single-Ply Roofing:

1. Do not use petroleum-based products in conjunction with single-ply roofing.
2. All sealants used in conjunction with single-ply roofing shall be approved by roof membrane manufacturer.

3.3 INSTALLATION

A. Fabricate and install items in conformance with drawing details and SMACNA and NRCA manuals.

1. Install premanufactured items in accordance with manufacturer’s recommendations.

B. Ensure that items are installed in true and accurate alignment with other items and related work; that joints are accurately fitted; that exposed surfaces are free from dents; that corners are reinforced; that seams are watertight.

C. All work shall be left free of passivators, oil, grease, or acid residue, ready to receive paint finish.

D. Wherever possible, all fasteners shall be concealed. All exposed fasteners shall have neoprene gaskets and be capped with a bead of sealant.

E. Install counter-flashings in reglets with continuous bead of sealant.

3.4 TOUCH-UP

A. Where galvanized finish is damaged by fabrication or installation, repair with specified touch-up material, applying in accordance with manufacturer's printed instructions.

END OF SECTION

SECTION 07 72 13

MANUFACTURED CURBS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Prefabricated roof curbs.

1.2 RELATED SECTIONS

A. Section 07 54 23 – Thermoplastic-Polyolefin Roofing.

B. Divisions 21 - 23 – Mechanical.

C. Divisions 25 - 28 – Electrical.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards and Manuals:

1. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Submit shop drawings indicating dimensions, materials, reinforcement and anchoring devices.

1.5 DESIGN REQUIREMENTS

A. Curbs shall be designed to support imposed equipment and lateral loads with no deflection or failure of any component part.

1.6 QUALITY ASSURANCE

A. Standards of Manufacture: Manufacturer designated herein indicates quality of materials to be used on this project. Products of other manufacturers equal to these standards in all respects may be provided.

1.7 WARRANTY

A. Provide five-year warranty under provisions of Division 01.

B. Warranty: Include coverage for defects in materials and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Thybar Corporation. Products:
   1. Model No. TC-3 prefabricated insulated roof curb.
   2. Model No. TEMS-3 prefabricated roof curb.
   3. Model No. TCC-5 pipe penetration system.

B. Substitutions: Under provisions of Division 01.

2.2 FABRICATION

A. Curbs shall be constructed using minimum 16 gauge ASTM A653/653M G90 galvanized steel with mitered and continuously welded corners, integral base plates, internally reinforced with 1 inch x 1 inch x 1/8 inch steel angles, and factory installed pressure treated wood nailers. All seams shall be joined by continuous water and air tight welds.
   1. Insulated Curbs: Insulation shall be factory insulated with 1-1/2 inch thick, three pound density fiberglass antimicrobial rigid insulation

B. Minimum height of curb above roofing surface shall be 8 inches unless otherwise noted on Drawings.

C. Curbs shall be constructed to match slope of roof and provide a level top surface for mounting of equipment.

D. Curb platforms shall be manufactured to accommodate the mounting of all equipment, penetrations and other items as required to mount and weatherproof all equipment.

PART 3 EXECUTION

3.1 COORDINATION

A. Size of curbs and required options shall be coordinated by curb manufacturer and Contractor prior to fabrication.

3.2 EXAMINATION

A. Verify that openings are ready to receive work.

B. Verify that field measurements are as shown on shop drawings and as instructed by manufacturer.

C. Beginning of installation means installer accepts existing substrate conditions.

3.3 INSTALLATION

A. Curbs shall be installed in strict conformance with manufacturer's printed instructions and as indicated on Drawings.

END OF SECTION

SECTION 07 72 33

ROOF HATCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Prefabricated roof hatches, with integral support curbs, operable hardware and counter-flashings.

B. Roof hatch guards.

C. Ladder safety posts.

1.2 RELATED SECTIONS

A. Section 05 31 00 – Steel Decking.

B. Section 05 50 00 – Metal Fabrications: Roof access ladders.

C. Section 07 54 23 – Thermoplastic-Polyolefin Roofing.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of this Project Manual.

C. Referenced Standards:

1. ASTM A36 – Standard Specification for Structural Steel.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Provide data on unit construction, sizes, configuration, jointing methods and locations when applicable, and attachment method.

C. Manufacturer's Installation Instructions: Indicate special installation criteria, interface with adjacent components.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Babcock – Davis. Products:

1. Security Roof Hatches: Model No. BRHSA36x30S2T-D5A.
2. Roof Hatch Guards: Model No. SRSG 36 x 30.
3. Ladder Safety Post: Model No. BSPY.

B. Bilco.

C. Babcock – Davis.

D. Milcor.

E. Substitutions: Under provisions of Division 01.

2.2 ROOF HATCHES

A. Unit: 30 inches by 36 inches size, single leaf type.
   1. Cover and Liner: 0.090-inch aluminum cover with 1 inch rigid fiberboard insulation and 0.040-inch aluminum cover liner.
   2. Curb: 0.090-inch aluminum curb with fully welded corners and 1 inch rigid fiberboard insulation.
   3. Hinges: Type 316 stainless steel tamper-proof hinge contained within hatch as part of spring assembly.
   4. Latch: Type 304 stainless steel slam latch with turn handle and inside/outside padlock hasps.
   5. Springs: Greased heavy-duty compression springs in telescoping tubes.
   6. Hardware:
      a. Type 316 stainless steel hold open arm(s) with red vinyl grip handle that automatically locks door when opened.
      b. Furnish hatches with EPDM draft seal.
      c. Lock: Southern Steel 1010AM Interior/exterior prep detention lock.
   7. Mounting Flanges: Double wall curb with 3.5 inch horizontal mounting flange.
   8. Finish: All aluminum components shall have mill finish.

2.3 ROOF HATCH GUARDS

A. Top rail, mid rail, and self-closing gate, with hatch curb acting as toe plate.
   1. Test Load: 200-pounds.

B. Height: Minimum 42 inches above finished roof deck.

C. Pipe: Galvanized, 1-1/4 inch inside diameter, A53 Grade B seamed pipe.

D. Pipe Ends and Tops: Covered or plugged with weather and light resistant material.

E. Bolts and Washers: 3/8 inch by 2-1/2 inch, grade Z, zinc plated.

F. Finish: Galvanized.

2.4 FABRICATION

A. Fabricate components free of visual distortion or defects. Weld corners and joints.

B. Provide for removal of condensation occurring within components or assembly.

C. Fit components for weathertight assembly.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install roof hatches, roof hatch guards, and ladder safety posts in accordance with manufacturer's instructions.

B. Coordinate with installation of roofing system and related flashings for weathertight installation.

C. Apply bituminous paint on surfaces of units in contact with cementitious materials or dissimilar metals.

D. Test units for proper function and adjust until proper operation is achieved.

3.2 CLEANING

A. Clean exposed surfaces using methods acceptable to the manufacturer which will not damage finish.

END OF SECTION

SECTION 07 81 16

CEMENTITIOUS FIREPROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Work under this Section consists of the furnishing of all labor, materials, equipment and services necessary for, and incidental to, the complete and proper installation of all spray-applied fireproofing and related work as shown on Drawings or specified in this Section, and in accordance with all applicable requirements of the Contract Documents.

1. The following schedule is used in the project:

a. Type I – Standard durability gypsum based cementitious fireproofing.

b. Type II – High durability Portland cement fireproofing.

B. The material and installation shall conform to the applicable building code requirements of all authorities having jurisdiction.

C. For patch and repair work, match existing adjacent fireproofing thickness to obtain the code-required fire rating for that location.

1.2 RELATED SECTIONS

A. Section 05 12 00 – Structural Steel Framing.

B. Section 05 31 00 – Steel Decking.

C. Divisions 21 - 23 – Mechanical.

D. Divisions 25 - 28 – Electrical.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness.
2. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
3. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.
4. ASTM E605 – Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members.

5. ASTM E736 – Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials (SFRM) Applied to Structural Members.
6. ASTM E759 – Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members.
7. ASTM E760 – Standard Test Method for Effect of Impact on Bonding of Sprayed Fire Resistive Material Applied to Structural Members.
8. ASTM E761 – Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members.
9. ASTM E859 – Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members.
10. ASTM E937 – Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive-Material (SFRM) Applied to Structural Members.
11. ASTM E1354 – Standard Test Method for Heat Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter.
12. ASTM G21 – Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
13. AWCI – Inspection Procedure for Field-Applied Sprayed Fire Protection Materials.
14. SFM Approved Materials and Equipment Listing Services.
15. UL Fire Resistance Directory.

1.4 SUBMITTALS

A. Submit all information under provisions of Division 01.

B. Manufacturers' Data:
   1. Submit manufacturer's instructions for proper application of sprayed fireproofing.
   2. Submit product data indicating UL listings, product characteristics and performance and limitation criteria.

C. Submit manufacturer’s certificate under provisions of Division 01 stating that products meet or exceed the specified requirements.

D. Submit manufacturer’s letter verifying that the UL Designs selected for the project are not load restricted.

E. Test Data: From a qualified independent testing agency employed and paid by the manufacturer. Provide reports indicating that physical properties of proposed sprayed on fireproofing products comply with specified requirements based on comprehensive testing of current product formulations according to the following requirements:
   1. Testing is performed on sprayed on fireproofing materials randomly selected from bags bearing the applicable classification marking of UL or another inspecting and testing agency acceptable to authorities having jurisdiction.
   2. Testing is performed on specimens of sprayed on fireproofing materials that comply with laboratory testing requirements specified in Part 2 and are otherwise identical in every respect to the installed fireproofing including application of sealers, topcoats, tamping, troweling, rolling and water overspray, if any of these are used in final application.

3. Qualified independent testing agency does testing on laboratory specimens that it witnessed during preparation and conditioning. Include in test reports a full description of preparation and conditioning of laboratory test specimens.
4. Test reports without the above information are not acceptable.

F. Fire Testing: Submit evidence that the cementitious fireproofing has been subjected to full scale ASTM E84 and ASTM E119 fire testing by Underwriters Laboratories Inc. Include evidence that the fire testing was sponsored by the manufacturer and that the material tested was produced at the manufacturer's facility under the supervision of Underwriters Laboratories Inc. personnel. Letters documenting classification status are not acceptable evidence of compliance with this Section.

G. Test Reports:
1. Submit all test reports under provisions of Division 01.
2. For primers and other coatings applied to structural steel from a qualified independent testing agency employed and paid by Contractor indicating that primers and coatings proposed for application in shop or field are compatible with sprayed on fireproofing. Instruct laboratory to determine compatibility as follows:
a. By testing for bond per ASTM E736 and requirements specified in UL "Fire Resistance Directory" about coating materials.
b. By verifying that fireproofing manufacturer has not found primers or coatings to be incompatible with fireproofing based on its own laboratory testing or field experience.

H. Shop Drawings: Submit shop drawings indicating the following:
1. Where and what kinds of surface preparations are required before applying fireproofing.
2. Extent of sprayed fire resistive material for each different construction and fire resistance rating including the following:
a. Applicable fire resistive design designations of inspecting and testing agency applicable to authorities having jurisdiction.
b. Minimum thickness needed to achieve required fire resistance ratings of structural components and assemblies.
c. Treatment of fireproofing after its application.

I. ICC Evaluation reports or research reports of the model code organization acceptable to authorities having jurisdiction showing that the sprayed fire resistive material complies with the building code in effect for the Project.

1.5 USE CRITERIA

A. Standard Durability: Interior locations, concealed conditions for buildings less than 75 feet in height.

B. Intermediate Durability: Interior locations, exposed to view only, or buildings 75 feet to less than 420 feet in height.

C. Super High Rise Durability: Interior locations, exposed to view only, or buildings 420 feet or greater in height.

D. Medium Durability: Interior locations, exposed conditions subject to abrasion and/or moisture.

E. High Durability: Interior or exterior locations, exposed conditions subject to impact and/or direct moisture.

1.6 QUALITY ASSURANCE

A. Fireproofing work shall be installed by a firm with not less than three years of successful experience in the application of specified fireproofing materials on projects of similar scope. Applicator shall be licensed or otherwise approved in writing by the manufacturer of fireproofing materials.

B. Products, execution and fireproofing thickness and density shall conform to the applicable code requirements for the required fire-resistance ratings for the type of member / assembly to be fireproofed.

1. UL design listings must state that the loading was determined by Allowable Stress Design Method or Load and Resistance Factor Design Method.

C. Sprayed fireproofing shall form a sound bond with the steel.

D. Prior to the execution of work, Contractor shall call a pre-installation meeting to review product selection, check substrates for acceptability, verify designs and thickness, discuss inspection procedures, and coordinate the fireproofing installation with the work of other trades. The meeting shall be attended by Contractor, fireproofing applicator, an employee of the fireproofing manufacturer, and a representative of the independent testing agency.

E. Obtain sprayed fire resistive materials for all required products from a single manufacturer.

F. Prior to installation of the fireproofing, prepare a sample installation of at least 100 square feet over a representative area on site. The sample area shall be tested for density, and bond strength to assure compliance with the submitted independent laboratory reports or the project requirements.

G. Sprayed fireproofing shall meet requirements of systems approved by State Fire Marshal.

H. Sprayed fireproofing shall be in compliance with CBC Section 704.13.

I. Special inspections and tests of sprayed fire-resistant materials applied to floor, roof, and wall assemblies and structural members shall be performed in accordance with CBC Sections 1705.15.1 through 1705.15.6.

J. Applicator Qualifications: Applicator shall be approved by sprayed fireproofing manufacturer, including qualified factory training where recommended by manufacturer.

K. Fireproofing products shall be 100 percent free of asbestos and mineral wool fibers and contain less than ten percent vermiculite.

1.7 DELIVERY, STORAGE AND HANDLING

A. Conform to the requirements specified in Division 01.

B. Material shall be delivered in original unopened packages, fully identified as to manufacturer, brand or other identifying data, and bearing the proper Underwriters' Laboratories, Inc. labels for fire hazard and fire-resistance classification.

C. Material shall be stored (above ground), under cover and in a dry location until ready for use. All bags that have been exposed to water before use shall be found unsuitable for use and discarded. Stock of material is to be rotated and used prior to its expiration date.

D. Leave seals unbroken and labels intact until time of use. Remove from job site any rejected or damaged packages found unsuitable for use. Remove from job site any bags of sprayed fireproofing materials that have been exposed to water before use.

1.8 PROJECT/SITE CONDITIONS

A. A minimum temperature of 40 degrees F for air and substrate must be maintained during and for 24 hours after application of the sprayed fireproofing. If necessary for job progress, Contractor shall provide enclosures with heat to maintain temperatures.

B. Contractor shall provide ventilation to allow for proper drying of the fireproofing during and subsequent to its application. In poorly ventilated areas lacking natural ventilation, forced air ventilation (minimum total air exchange rate of four times per hour) shall be employed to cause the material to become substantially dry.

C. Protection:

1. Protect adjacent surfaces and equipment from damage by overspray, fall-out and dusting-off of sprayed fireproofing materials.
2. Provide temporary enclosures to prevent spray fireproofing from contaminating air.
3. Provide means to prevent damage to sprayed fireproofing from inclement weather.
4. Provide tarping of all floor areas where spray fireproofing is to occur.

1.9 SEQUENCING

A. Prior to installation of sprayed fireproofing all other trades must have completed installation of all items such as hangers, clamps, and other attachments for work suspended from, attached to, or passing through construction required to receive sprayed fireproofing.

B. Apply sprayed fireproofing prior to installation of ducts, piping conduit, and other work preventing correct application.

C. At roof decks that do not receive concrete fill, apply no fireproofing to underside of roof decking until completion of roofing installation and until roof traffic has ceased.

1.10 WARRANTY

A. Special Project Warranty: Submit written warranty, executed by Contractor and cosigned by Installer, agreeing to repair/replace fireproofing work of this Section, which has cracked, flaked, dusted excessively, peeled or fallen from substrate, or otherwise deteriorated to a condition where it would not perform effectively as intended for fireproofing purposes; due substantially to defective materials or workmanship and not due to abuse by occupants, improper maintenance, unforeseeable ambient exposure, or other causes beyond anticipated conditions and Contractor’s/Installer’s control. Warranty period shall be two years after date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Acceptable Manufacturers and Products:

1. Basis-of-Design: Construction Products Division of GCP Applied Technologies., Cambridge, MA; 866-333-3726, www.gcpat.com/construction/en-us/fire-protection. Products:
   a. Standard Durability: Monokote Type MK-6/HY.
   b. High Durability: Monokote Z-146.
   c. Decking Prep: Spatterkote SK-3.
2. Isolatek International (Cafco), Stanhope, NJ; 973-347-1200, www.cafco.com.
3. Carboline, St. Louis, MO; 800-848-4645, www.carboline.com.

B. Substitutions: Under provisions of Division 01.

1. UL tested assemblies used in the design of this project are based on products by Construction Products Division of GCP Applied Technologies. If other manufacturers are proposed for installation, submit equivalent UL tested assemblies using that manufacturer for Architect's review prior to the submission of shop drawings.
2. Request for Substitution: Provide the following information with any request for substitution on the item or process that is being requested to be substituted:
   a. A complete description of the item or process.
   b. Samples of color and texture.
   c. Submit a complete thickness schedule for each structural component and assembly to be fireproofed.
   d. Performance characteristics and production rates. All performance tests shall be conducted at the average density listed in the UL Fire Resistance Directory.
   e. A list of at least three other projects of similar nature to this contract where the products have been in use for at least one year, including telephone number and person to contact at these other projects.
   f. An analysis of the effect of the substitution on the schedule and contract cost and on the overall project as it relates to adjoining work.

2.2 MATERIALS – STANDARD DURABILITY

A. The sprayed material shall be a factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, mixed with water at the project site to form a slurry or mortar before conveyance and application. The fireproofing material shall be free of asbestos and mineral wool, and contain less than ten percent vermiculite. The cementitious fireproofing shall comply with the following physical performance standards:

1. Dry Density: 15 pounds per cubic foot minimum average density regardless of density indicated in referenced fire-resistive design, or greater if required to attain fire-resistance ratings indicated, as determined per ASTM E605 or Appendix A "Alternate Method for Density Determination" of AWCI Technical Manual 12-A.
2. Deflection: Material shall not crack or delaminate from the surface to which it is applied when tested in accordance with ASTM E759.

3. Bond Impact: Material subject to impact tests in accordance with ASTM E760 shall not crack or delaminate from the surface to which it is applied.
4. Bond Strength: Fireproofing material when tested in accordance with ASTM E736, shall have a minimum average bond strength of 200 pounds per square foot.
5. Air Erosion: Maximum allowable weight loss of the fireproofing material shall be 0.0 grams per square foot when tested in accordance with ASTM E859. For laboratory tests, the minimum sprayed fire resistive material thickness shall be 0.75 inch, the maximum dry density shall be 15 pounds per cubic foot. Test specimens are not prepurged by mechanically induced air velocities and the total reported weight loss shall be the total weight loss over a 24 hour period.
6. High Speed Air Erosion: Materials to be used in plenums or ducts shall exhibit no continued erosion after four hours at an air speed of 2,500 feet per minute. (29 miles per hour) when tested in accordance with the UMC (1985) Appendix A, Section 10.116 and ASTM E859.
7. Compressive Strength: The fireproofing shall not deform more than ten percent when subjected to compressive forces of 10 pounds per square inch when tested in accordance with ASTM E761. Minimum sprayed-on fireproofing thickness tested shall be 0.75 inch and the minimum dry density shall be as specified, but not less than 15 pounds per cubic foot.
8. Corrosion Resistance: Steel with applied fireproofing shall be tested in accordance with ASTM E937 and shall not promote corrosion of steel.
9. Surface Burning Characteristics: Material shall exhibit the following surface burning characteristics when tested in accordance with ASTM E84:
    a. Flame Spread: 0.
    b. Smoke Development: 0.
10. Fungal Resistance: The fireproofing material shall be tested in accordance with ASTM G21 and shall show resistance to mold growth for a period of 28 days.

B. Mixing water shall be clean, fresh and suitable for domestic consumption and free from such amounts of mineral or organic substances as would affect the set of the fireproofing material.

C. Provide accessories which comply with manufacturers recommendations and which meet fire resistance designs and code requirements. Such accessories include but are not limited to: bonding agents, topcoats, stud pins, metal lath, scrim and plastic netting.

2.3 MATERIALS – HIGH DURABILITY

A. The sprayed material shall be a factory-mixed, Portland cement based dry formulation, complying with indicated fire-resistance design, mixed with water at the project site to form a slurry or mortar before conveyance and application. The fireproofing material shall be free of asbestos and mineral wool, and contain less than ten percent vermiculite. The cementitious fireproofing shall comply with the following physical performance standards:

1. Dry Density: The field density shall be measured, in accordance with ASTM Standard E605. Minimum average density shall be 40 pounds per cubic foot as listed in the UL Fire Resistance Directory, ICC Evaluation Report or as required by the authority having jurisdiction.
2. Deflection: Material shall not crack or delaminate from the surface to which it is applied when tested in accordance with ASTM E759.

3. Bond Impact: Material subject to impact tests in accordance with ASTM E760 shall not crack or delaminate from the surface to which it is applied.
4. Bond Strength: Fireproofing, when tested in accordance with ASTM E736, shall have a minimum average bond strength of 10,000 pounds per square foot.
5. Air Erosion: Maximum allowable weight loss of the fireproofing material shall be 0.0 grams per square foot when tested in accordance with ASTM E859.
6. Compressive Strength: The fireproofing shall not deform more than ten percent when subjected to compressive forces of 500 pounds per square inch when tested in accordance with ASTM E761.
7. Corrosion Resistance: Steel with applied fireproofing shall be tested in accordance with ASTM E937 and shall not promote corrosion of steel.
8. Surface Burning Characteristics: Material shall exhibit the following surface burning characteristics when tested in accordance with ASTM E84:
    a. Flame Spread: 0.
    b. Smoke Development: 0.
9. Durometer Hardness: The fireproofing shall have a minimum Durometer Hardness of 40 when tested in accordance with ASTM D2240.
10. Fungal Resistance: Fireproofing material shall be tested in accordance with ASTM G21 and shall show resistance to mold growth for a period of sixty days.

B. The sprayed fireproofing material shall have been tested and reported by Underwriters' Laboratories, Inc. in accordance with the procedures of ASTM E119.

C. Mixing water shall be clean, fresh and suitable for domestic consumption and free from such amounts of mineral or organic substances as would affect the set of the fireproofing material.

2.4 ACCESSORIES

A. Spatterkote SK-3 shall be applied to all cellular decking prior to the application of the specified fireproofing material.

B. Metal Lath: Expanded metal flat diamond mesh with galvanized finish as manufactured by ClarkDietrich Building Systems, Cemco, Amico, or accepted equal. Weight of lath shall be as required by UL Designs. Provide clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.

PART 3 EXECUTION

3.1 EXAMINATION

A. All surfaces to receive sprayed fireproofing shall be free of oil, grease, rolling compounds or lubricants, loose mill scale, excess rust, non-compatible primer, lock down agent, dirt or any other foreign substances that will impair proper adhesion of the fireproofing to the substrate. Where necessary, cleaning of surfaces to receive fireproofing shall be the responsibility of Contractor.

B. Structural steel and steel deck surfaces shall be compatible with sprayed fireproofing.

1. Primed structural steel shall be tested and reported by Underwriters' Laboratories. The report shall indicate approval for the specific primer and its use on the maximum uninterrupted span of the structural steel surface. All primed structural steel shall bear the appropriate Underwriters' Laboratories Inc. label indicating compliance.

2. Where a corrosive environment such as where excessive moisture or free water will contact the fireproofing or fireproofed member, a coating must be applied to prevent corrosion of the steel surfaces. The coating must be applied prior to the fireproofing application. The coatings manufacturer shall certify as to the compatibility of the coating with Portland cement based products and as to the degree of corrosion protection offered. Underwriters' Laboratories, Inc. has specific Requirements when coatings are used as substrates for fireproofing materials.

3. Rolling compounds or lubricants:

a. Architect shall determine whether the lock-down agent and/or primer has been tested in accordance with ASTM E119 with the specified sprayed replacement fireproofing material to provide the required fire resistant rating.

b. Steel surfaces that have been sprayed with a lock-down agent and/or primer will require a fireproofing bond test to determine if the lock-down formulation or primer will impair proper adhesion. Determination of the compatibility for the lock-down agent and/or primer with the sprayed fireproofing shall be the responsibility of the lock-down and/or primer manufacturer.

C. Application of the fireproofing shall not begin until Contractor, applicator, and fireproofing testing laboratory (inspector) have examined surfaces to receive fireproofing and determined that the surfaces are acceptable to receive the fireproofing material.

3.2 PREPARATION

A. Prior to application of fireproofing, clips, hangers, support sleeves and other attachments required to penetrate the fireproofing shall be in place.

1. Securely attach lath to framing members with mechanical fasteners. Lap edges of lath a minimum of 2 inches.

B. Ducts, piping, equipment or other suspended matter which would interfere with application of fireproofing materials shall not be positioned until fireproofing work is complete.

C. Prior to application of the fireproofing to the underside of roof decks, all roofing applications shall be completed. All roof traffic shall be prohibited upon commencement of the fireproofing application and until the fireproofing material is cured and fully dried.

D. Provide masking, drop cloths, or other satisfactory coverings to prevent overspray of sprayed fireproofing.

E. Where concrete, masonry or other surfaces subject to overspray are to remain permanently exposed, they shall be protected with masking, drop cloths, or other satisfactory coverings.

F. Fireproofing is slippery when wet. Contractor and Applicator shall be responsible for posting appropriate cautionary SLIPPERY WHEN WET signs. Signs shall be posted in all areas in contact with wet fireproofing material. In addition, Contractor shall be responsible for appropriate barriers to prevent entry by non-fireproofing workers into the fireproofing spray and mixer areas or other areas exposed to wet fireproofing material.

G. Prior to application of the fireproofing material to all concrete substrates, a bonding agent approved by the fireproofing material manufacturer, shall be applied.

3.3 APPLICATION

A. Equipment and application procedure shall conform to the material manufacturer's application instructions.

B. Apply sprayed fire resistive material that is identical to products tested as specified in this Section, with respect to use of sealers, topcoats, troweling, water overspray, or other materials and procedures affecting the test results.

C. Maintain ambient conditions during installation and for cure period following installation, as recommended by manufacturer. Provide ventilation and avoid excessive rate of drying. Protect from exposure to sun.

D. Utilize probes or other approved means to determine thickness during application.

3.4 FIELD QUALITY CONTROL

A. Owner will pay an independent testing laboratory to sample and verify the thickness and density of the fireproofing in accordance with provisions of CBC Sections 1705.15.1 through 1705.15.6 and the "Inspection Procedure for Field-Applied Sprayed Fire Protection Materials" as published by the AWCI. Where density samples are of irregular shape, a displacement method approved by Underwriters Laboratories Inc. shall be used to determine in place fireproofing density.

B. Owner will pay an independent testing laboratory to randomly sample and verify the bond strength of the fireproofing in accordance with provisions of ASTM E736.

C. The results of the above tests shall be made available to all parties at the completion of each floor.

D. Areas not in compliance will be reported for proper repair. Contractor shall patch areas from which testing samples have been removed.

E. Repair or replace fireproofing found (by field tests) to be below compliance requirements. Add extra course of fireproofing material where feasible to achieve compliance; otherwise remove course and replace with newly installed complying work.

3.5 CLEANING

A. After the completion of fireproofing work, application equipment shall be removed.

B. Floors, walls, and other adjacent surfaces shall be left in a clean condition.

C. Immediately upon completion of spraying operations in each containable area of project, remove over-spray and fall-out of materials from surfaces of the work, and clean surfaces to remove evidence of soiling. Repair or replace damaged work to restore surfaces to acceptable condition.

3.6 PATCHING

A. Maintain protection of structure afforded by fireproofing by patching any areas which have been removed or damaged.

B. All patching and repairing of spray-applied fireproofing, due to damage by other trades, shall be performed with same materials under this Section, and paid for by the trade(s) responsible for the damage.

3.7 PROTECTION

A. Protection: Installer of sprayed-on fireproofing shall advise Contractor of protection requirements for fireproofing work, which will ensure that fireproofing will be substantially without damage or deterioration at time of Substantial Completion of project. Provide protection from reasonably predictable harmful exposures. Repair or replace work which has not been successfully protected.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Mineral wool safing insulation in wall and floor/ceiling construction.

B. Firestop sealants and caulks.

C. Elastomeric firestop sealants.

D. Firestop putty.

E. Intumescent putty pads.

F. Flexible firestop spray.

G. Head-of-wall gasket.

H. Firestop collars.

I. Firestopping for large openings.

J. Cast-in-place firestop devices.

K. Intumescent wrap.

L. Firestop mortar.

M. Fire-rated cable pathway.

N. Fire-rated HVAC retaining angles.

O. Firestop plugs.

P. Fire-rated T collar devices.

Q. Fire-rated grommets.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 07 92 00 – Joint Sealants.

C. Section 09 29 00 – Gypsum Board.

D. Divisions 21 – 23 Sections, as applicable to mechanical work.

E. Divisions 26 – 28 Sections, as applicable to electrical work.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM C679 – Standard test Method for Tack-Free Time of Elastomeric Sealants.
2. ASTM D6904 – Standard Practice for Resistance to Wind-Driven Rain for Exterior Coatings Applied on Masonry.
3. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.
4. ASTM E814 – Standard Test Method for Fire Tests of Penetration Firestop Systems.
5. ASTM E1399 Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.
6. ASTM E1966 – Standard Test Method for Fire-Resistive Joint Systems.
7. ASTM E2174 – Standard Practice for On Site Inspection of Installed Fire Stops.
8. ASTM E2307 – Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus
9. ASTM E2393 – Standard Practice for On Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.
10. ASTM G21 – Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
11. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments.
12. UL Fire Resistance Directory.
13. UL 263 – Fire Tests of Building Construction and Materials.
14. UL 723 – Test for Surface Burning Characteristics of Building Materials.
15. UL 1479 – Standard for Fire Tests of Through-Penetration Firestops.
16. UL 2079 – Tests for Fire Resistance of Building Joint Systems.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Provide manufacturer's brochures describing firestop materials and insulation proposed for use, and types of mechanical fasteners to be used in the installation of the firestopping materials.

C. Certificates of Compliance: Before installation of products specified in this Section, Contractor shall furnish to Architect a certificate certifying that materials to be incorporated in the work conform to specified requirements.

D. Submit certification that the installers of products specified in this Section meet the qualification requirements described in Article 1.6 of this Section.

E. Submit manufacturer's product literature and installation procedures for each type of firestop material to be installed. Literature shall indicate product characteristics, typical uses, performance and limitation criteria, and test data. Submit cured samples of firestop materials.

F. Submit material safety data sheets for each product at the time firestopping products are delivered to the job site.

G. Shop Drawings: Show typical installation details for the methods of installation. Indicate which firestop materials will be used where and application requirements to meet specific jobsite conditions.

H. Provide manufacturer's Engineering Judgment (EJ) identification number and drawing details when no UL system is available for an application. Engineering Judgment shall be developed in accordance with the latest California Fire Code requirements. Engineering Judgment shall include both project name, and name of contractor who will install the firestop system in accordance with EJ drawing. Submit Engineering Judgment to Authority Having Jurisdiction (AHJ) for review and approval prior to installation.

1.5 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Materials and installation shall comply with requirements of governing regulations and authorities.

1. Comply with requirements of 2022 California Building Code, Chapter 7, "Fire and Smoke Protection Features".

B. Firestopping systems (materials and design) shall be F-rated to meet the hourly rating of the wall or floor as tested by nationally accepted test agencies per ASTM E814, UL 1479, or UL 2079 in a configuration representative of field conditions. T-ratings for floors shall be as required in the 2022 CBC Chapter 7 "Fire and Smoke Protection Features", as applicable to design conditions. L-ratings shall be tested in accordance with ANSI/UL 1479 (smoke barriers) and ANSI/UL 2079 (joints), such that for each 100 square feet of area, the total cumulative leakage of each firestop assembly shall not exceed 50 cubic feet per minute.

C. To the fullest extent possible, all firestopping products installed on the project shall be from one manufacturer.

D. Unless specified and approved, no pipe insulation shall be removed; all insulation shall remain intact, continuous and undamaged when firestopped.

E. A manufacturer's direct representative (not distributor or agent) shall be on-site prior to the initial installation of firestop systems to train appropriate Contractor personnel in proper selection and installation procedures. This shall be done per manufacturer's written recommendations published in their literature and drawing details.

F. Firestop systems do not reestablish the structural integrity of load-bearing partitions/ assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load-bearing or shear wall assembly.

G. Firestop applications for which no UL tested system is available through an acceptable manufacturer, submit acceptable manufacturer's Engineering Judgment derived from similar UL design systems or other acceptable tests, to local authorities having jurisdiction, for review and approval prior to installation. Engineering Judgment drawings shall meet the requirements set forth by the International Firestop Council (September 7, 1994).

1.6 INSTALLER QUALIFICATIONS

A. Engage an experienced installer who is certified, licensed, and FM Approved in accordance with FM 4991, certified by UL as a Qualified Contractor, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products per specified requirements. A manufacturer's willingness to sell its firestopping products to Contractor or to an Installer engaged by Contractor does not confer qualification on the buyer.

B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems to a single sole source firestop specialty contractor.

C. The work shall be installed by a contractor with at least one of the following qualifications:

1. FM 4991 Approved Contractor.
2. UL Approved Contractor.
3. Qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products per specified requirements.

D. The installer shall have no less than three years of experience with fire stop installation.

1.7 DEFINITION

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, water and hot gases through penetrations in fire-rated wall and floor assemblies.

1.8 SYSTEM DESCRIPTION

A. Firestopping materials shall comply with ASTM E119, ASTM E814, ASTM E1399, ASTM E1966, ASTM E2307, UL 263, UL 1479 and UL 2079 to achieve a fire rating as noted on Drawings.

B. Firestop all interruptions to fire rated assemblies, materials, and components.

1.9 PERFORMANCE REQUIREMENTS

A. Provide and install firestopping materials to meet applicable codes and installation requirements for each firestopping application. Products using caulking, putty, wrap strips, mortar, composite boards and/or mechanical devices shall be used as appropriate for the specific condition.

B. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

C. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

D. When caulking is used, provide and install flexible caulking materials. Cured firestop materials 1/8 inch thick shall be able to bend around a 1 inch mandrel without breaking.

E. Provide products that upon curing do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction. Latex sealants containing sodium silicate or other water soluble intumescent ingredients are not permitted.

F. Provide firestop sealants sufficiently flexible to accommodate motion such as pipe vibration, water hammer, thermal expansion and other normal building movement without damage to the seal.

G. Pipe insulation shall not be removed, cut away or otherwise interrupted through wall or floor openings. Provide products appropriately tested for the thickness and type of insulation utilized.

H. Fire rated pathway devices shall be the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur.

I. When mechanical cable pathways are not practical, openings within walls and floors designed to accommodate voice, data and video cabling shall be provided with re-enterable products specifically designed for retrofit.

J. Penetrants passing through fire-resistance rated floor-ceiling assemblies contained within chase wall assemblies shall be protected with products tested by being fully exposed to the fire outside of the chase wall. Systems within the UL Fire Resistance Directory that meet this criterion are identified with the words “Chase Wall Optional”.

K. Provide fire-resistive joint sealants sufficiently flexible to accommodate movement such as thermal expansion and other normal building movement without damage to the seal.

L. Provide fire-resistive joint sealants designed to accommodate a specific range of movement and tested for this purpose in accordance with a cyclic movement test criteria as outlined in UL 2079.

M. Provide penetration firestop systems subjected to an air leakage test conducted in accordance with Standard, UL 1479 for penetrations with published L-Ratings for ambient and elevated temperatures as evidence of the ability of firestop system to restrict the movement of smoke.

N. Provide firestopping composed of components that are listed as compatible with each other, the substrates forming openings and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

O. Provide components for each firestopping system that is needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance rated systems.

P. Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E814.

1. F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.

Q. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E814.

1. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
2. T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

R. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E814.

1. L-Rating: Not exceeding 5.0 cubic feet per minute per square foot of penetration opening at both ambient and elevated temperatures.

S. At fire rated assemblies, provide a firestop system with an Assembly Rating as determined by UL 2079 that is equal to the time rating of construction assembly.

T. Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of one or less as tested per ASTM G21.

U. Rain and water resistance: Provide perimeter joint sealant tested in accordance with ASTM D6904 with less than one hour tack free time as tested in accordance with ASTM C679.

V. To the greatest extent possible, provide cast-in-place firestop devices prior to concrete placement.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site in the manufacturer's original packaging. Clearly identify manufacturer, contents, brand name, applicable standard, lot number, UL label and mixing and installation instructions.

B. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions. Immediately remove damaged or deteriorated materials from the job site.

C. Comply with recommended procedures, precautions, or remedies described in material safety data sheets as applicable.

D. All firestop materials shall be installed prior to expiration of shelf life.

E. Do not install damaged or expired materials.

1.11 SCHEDULING

A. Coordinate installation with other trades whose work may be affected or have effect.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

1.12 PROJECT CONDITIONS

A. Conform to manufacturer's printed instructions for installation and, when applicable, curing in accordance with temperature and humidity. Conform to ventilation and safety requirements.

B. Do not use materials that contain flammable solvents.

C. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

D. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

E. Weather conditions:

1. Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.
2. Do not install firestopping products when substrates are wet due to rain, frost, condensation, or other causes.

F. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable firestopping manufacturers, unless noted otherwise:

1. Hilti, Tulsa, OK; 866-445-8827, www.us.hilti.com.
2. Specified Technologies Inc. (STI), Somerville, NJ; 800-992-1180, www.stifirestop.com.
3. 3M, St. Paul, MN; 800-328-1687, www.solutions.3m.com.
4. Substitutions: Under provisions of Division 01.

2.2 MINERAL WOOL INSULATION

A. Acceptable Manufacturers and Products:

1. Owens Corning Thermafiber, Inc., Wabash, IN; 888-834-2371, www.thermafiber.com.
2. Johns Manville, Denver, CO; 800-654-3103, www.jm.com.
3. Rockwool, Milton, Ontario, Canada; 800-265-6878, www.rockwool.com.
4. Substitutions: Under provisions of Division 01.

B. At through penetrations, head of wall construction gaps, and perimeter safing slots, provide required density mineral wool per tested system, installed with correct orientation for joint movement and properly compressed per tested system.

C. Accessories: Provide all accessories and anchors for installation as recommended by the manufacturer.

2.3 FIRESTOP SEALANTS

A. Sealant for penetrations by noncombustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT).

B. Silicone Sealants:
   1. Acceptable Manufacturers and Products:
      a. Hilti. Product: CFS-S SIL Silicone Sealant.
      b. Specified Technologies Inc. Product: SpecSeal SIL Silicone Firestop Sealant.
      c. 3M. Products:
         1) Fire Barrier Water Tight Sealant 1003 SL.
         2) Fire Barrier Silicone Sealant 2000+.
      d. Substitutions: Under provisions of Division 01.
   2. Sealant shall be a one-part silicone compound, non-sag for vertical applications and self-leveling for horizontal applications. Sealant shall be UL Classified (UL 1479) and tested in accordance with ASTM E814 requirements. Penetrations in fire rated assemblies shall be protected and sealed in accordance with CBC Chapter 7 requirements.

C. Intumescent Latex Sealants:
   1. Acceptable Manufacturers and Products:
      a. Hilti. Product: FS-One Max.
      b. Specified Technologies Inc. (STI). Products:
         1) SpecSeal Series SSS Sealant.
         2) SpecSeal LCI Sealant.
         3) LC Sealant.
      c. Substitutions: Under provisions of Division 01.
   2. Sealant shall be a one-part intumescent latex compound. When exposed to high heat or flame, sealant shall be capable of expanding to seal off the annular spaces and voids at the joint. Expansion shall continue at temperatures greater than 230 degrees F. Sealant shall be thixotropic and suitable for caulking or troweling onto vertical and overhead surfaces. Sealant shall be UL Classified (UL 1479) and tested in accordance with ASTM E814 requirements. Penetrations in fire rated assemblies shall be protected and sealed in accordance with CBC Chapter 7 requirements.

2.4 ELASTOMERIC FIRESTOP SEALANT

A. Sealant for penetrations and joints between structurally separate sections of walls and floors at top-of-walls.

B. Acceptable Manufacturers and Products:
   1. Hilti. Products:
      a. CFS-S SIL GG.
      b. CFS-S SIL SL.
   2. STI. Product: SpecSeal Series ES100 Elastomeric Sealant.
   3. 3M. Products: Fire Barrier Sealants 1000, 1003, 2000, 2000+, 2001, and 2003.
   4. Substitutions: Under provisions of Division 01.

C. Elastomeric sealant shall be a non-halogenated, latex-based or silicone-based, highly flexible caulk. The sealant shall be thixotropic for high-build application using standard caulking equipment or by troweling onto vertical surfaces or overhead. Self-leveling sealants are acceptable for horizontal applications. The sealant shall be UL Classified (UL 2079) and tested to the requirements of ASTM E814. Closures in fire rated assemblies shall be protected and sealed in accordance with CBC Chapter 7.

2.5 ACRYLIC FIRESTOP SEALANT

A. Universal fire caulk, providing a flexible seal for fire rated joints and through penetrations.

B. Acceptable Manufacturers and Products:

1. Hilti. Product: CP 606
2. Substitutions: Under provisions of Division 01.

C. Acrylic-based firestop sealant that provides movement capability in fire rated joints and seals through-penetrations applications.

2.6 FIRESTOP PUTTY

A. Putty for penetrations by combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed flexible cable, or cable bundles and plastic pipe (closed piping systems). Clay-based products will not be allowed.

B. Acceptable Manufacturers and Products:

1. Hilti. Product: CP 618 Putty Stick.
2. STI. Product: SpecSeal SSP Putty.
3. Substitutions: Under provisions of Division 01.

C. Putty shall be a one-part intumescent, non-hardening compound. The putty, when exposed to high heat or flame shall be capable of expanding to seal off annular spaces created. Range of continuing expansion shall be from 230 degrees F to greater than 1,000 degrees F. The putty shall be soft and pliable with aggressive adhesion. The putty shall be UL Classified (UL 1479) and tested to the requirements of ASTM E814. Penetrations in fire rated assemblies shall be protected and sealed in accordance with CBC Chapter 7.

2.7 INTUMESCENT PUTTY PAD

A. Firestop Putty Pads: Intumescent moldable butyl-based firestop putty pad. Clay-based products will not be allowed.

B. Acceptable Manufacturers and Products:

1. Hilti. Products:
   a. CFS-P PA Putty Pad.
   b. CP 617 Putty Pad.
2. STI. Products:
   a. SpecSeal SSP4S 7.25 inches by 7.25 inches.
   b. SpecSeal SSP9S 9 inches by 9 inches.
3. Substitutions: Under provisions of Division 01.

2.8 FLEXIBLE FIRESTOP SPRAY

A. Firestop spray for perimeter fire barrier system, fire-rated construction joints, and other gaps.

B. Acceptable Manufacturers and Products:
   1. Hilti. Product: CFS-SP WB.
   2. STI. Products:
      a. SpecSeal AS200 Elastomeric Firestop Spray.
      b. SpecSeal Fast Tack Elastomeric Silicone/Urethane Hybrid Firestop Spray.
   3. 3M. Products: Firedam Spray 200 and Fire Barrier Spray.
   4. Substitutions: Under provisions of Division 01.

C. Spray shall be flexible, sprayable water-based coating that dries in ambient conditions to form a flexible seal that will compress/extend with the intended range of the joint. The spray shall be UL classified (UL 2079) and tested to the requirements of ASTM E1966. Closures in fire rated assemblies shall be protected and sealed in accordance with CBC Chapter 7. Provide silicone-based firestopping products where building perimeter fire barrier systems are required.

2.9 HEAD-OF-WALL GASKET

A. Intumescent cover for head-of-wall track providing fire, smoke, and acoustic ratings.

B. Acceptable Manufacturers and Products:
   1. Hilti. Product: CFS-TTS Top Track System.
   2. STI. Product: SpecSeal Series TTG SpeedFlexTrack Top Gasket.
   3. Substitutions: Under provisions of Division 01.

C. Preformed gasket shall be UL classified (UL 2079) and tested to the requirements of ASTM E1966. Closures in fire rated assemblies shall be protected and sealed in accordance with CBC Chapter 7.

2.10 FIRESTOP COLLARS

A. Collars for penetrations by combustible plastic pipe (opening piping systems).

B. Acceptable Manufacturers and Products:
   1. Hilti. Products:
      a. CP643N Firestop Collar.
      b. CP644 Firestop Collar.
   2. STI. Products:
      a. SpecSeal SSC.
      b. SpecSeal LLC Firestop Collar.
   3. 3M. Products:
      a. Fire Barrier PPD Plastic Pipe Device.
      b. Ultra Plastic Pipe Device.
   4. Substitutions: Under provisions of Division 01.

C. Firestop collar shall be made of a galvanized steel housing and shall contain a section of intumescent material. The material shall be designed to expand when exposed to fire. The collars shall be UL classified (UL 1479) and tested to the requirements of ASTM E814. Closures in fire rated assemblies shall be protected and sealed in accordance with CBC Chapter 7.

2.11 FIRESTOPPING FOR LARGE OPENINGS

A. Firestopping for large size, complex penetrations made to accommodate cable trays, multiple steel and copper pipes and electrical busways in raceways. Products may be used in conjunction with other firestopping products, systems, and devices.

B. Acceptable Manufacturers and Products:
   1. Hilti. Product: CFS-BL Firestop Block.
   2. STI. Products:
      a. SpecSeal SSB Firestop Pillows.
      b. SpecSeal CS Composite Sheet.
      c. SpecSeal SSM Mortar.
   3. 3M. Product: Fire Barrier Pillows or Fire Barrier CS-195+ Composite Sheet and Fire Barrier Mortar.
   4. Substitutions: Under provisions of Division 01.

C. For large openings, install intumescent compound or mortar. Intumescent compounds, when exposed to high heat or flame, shall be capable of expanding to seal off annular spaces created. Product shall be UL classified (UL 1479) and tested to the requirements of ASTM E814. Closures in fire rated assemblies shall be protected and sealed in accordance with CBC Chapter 7.

2.12 CAST-IN-PLACE FIRESTOP DEVICES

A. Devices for use with non-combustible and combustible pipes (closed and open piping systems), conduit, and cable bundles penetrating concrete floors and framed gypsum board wall assemblies.

B. Acceptable Manufacturers and Products:
   1. Hilti. Products:
      a. CP 680-P Cast-in-Place Firestop Device.
         1) Add Aerator Adapter when used in conjunction with aerator (Sovent) system.
      b. CP 680-M Cast-in-Place Firestop Device for use with non-combustible penetrants.
      c. CP 653 Firestop Speed Sleeve.
   2. STI. Product: SpecSeal CD Cast-In Firestop Device.
      a. Accessories:
         1) Add Aerator Adapter when used in conjunction with aerator (Sovent) system.
         2) Metal Deck Adapters on corrugated metal decks.
         3) Extension Tubes where required for thick concrete floors.
   3. Substitutions: Under provisions of Division 01.

C. Acceptable Penetrations: Sealing pipes and cables up to 6 inches in diameter in penetration through fire-rated floors, suitable for: vented or closed plastic pipes, PVC, CPVC, ABS, innerduct, FRPP, steel, cast-iron, copper pipes, insulated steel and copper pipes, EMT and ENT electrical conduits, bundled cables, and blank openings.

2.13 INTUMESCENT WRAP

A. Intumescent Wrap: Precut wrap strips for plastic and insulated pipe penetration through rated assemblies.

B. Acceptable Manufacturers and Products:
   1. Hilti. Product: CP 648, Firestop Wrap Strip.
   2. STI. Products:
      a. SpecSeal RED2.
      b. SpecSeal BLU2 Wrap Strip.
   3. Substitutions: Under provisions of Division 01.

2.14 FIRESTOP MORTAR

A. Fire-resistant, cement-based mortar for firestop-sealing medium-sized to large openings with non-combustible pipes or cable trays, and permanent fire seal for cables, cable trays and non-combustible pipes. For use with concrete and masonry assemblies, and for walls and floors rated up to three hours.

B. Acceptable Manufacturers and Products:
   1. Hilti. Product: CP 637 Firestop Mortar.
   2. STI. Product: SpecSeal SSM Firestop Mortar.
   3. Substitutions: Under provisions of Division 01.

2.15 FIRE-RATED CABLE PATHWAY

A. Gangable fire-rated device modules capable of retrofit, comprised of steel raceway with intumescent foam pads allowing 0 percent to 100 percent cable fill for cable penetrations through gypsum or CMU walls, concrete floors and concrete walls.

B. Acceptable Manufacturers and Products:
   1. STI. Product: SpecSeal EZ Path Pathway Device Series 22, 33 or 44.
   2. Substitutions: Under provisions of Division 01.

2.16 FIRE-RATED HVAC RETAINING ANGLES

A. Steel angle system with integral intumescent firestop gasket for use on steel HVAC ducts.

B. Acceptable Manufacturers and Products:
   1. STI. Product: SpecSeal Fyre-Flange Steel Firestop Retaining Angle.
   2. Substitutions: Under provisions of Division 01.

2.17 FIRESTOP PLUGS

A. Re-enterable, foam rubber plug impregnated with intumescent material for use in blank openings and cable sleeves.

B. Acceptable Manufacturers and Products:
   1. Hilti. Product: CFS-PL Firestop Plug.
   2. STI. Product: SpecSeal FP Intumescent Firestop Plug.
   3. Substitutions: Under provisions of Division 01.

2.18 FIRE-RATED T COLLAR DEVICES

A. Louvered steel collar system with synthetic aluminized polymer coolant wrap installed on metallic pipes where T Ratings are required by applicable building code requirements.

B. Acceptable Manufacturers and Products:
   1. STI. Product: SpecSeal T-Collar Device.
   2. Substitutions: Under provisions of Division 01.

2.19 FIRE-RATED GROMMETS

A. Molded two-piece grommet made from plenum grade polymer with a foam inner core for sealing individual cable penetrations up to 0.27 inch diameter.

B. Acceptable Manufacturers and Products:
   1. STI. Product: EZ-Firestop Grommet.
   2. Substitutions: Under provisions of Division 01.

2.20 ACCESSORIES

A. Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.1 CONDITIONS REQUIRING FIRESTOPPING

A. General: Provide firestopping for conditions specified whether or not firestopping is indicated and, if indicated, whether such material is designed as insulation, safing or otherwise.

B. Penetrations:
   1. Penetrations include conduit, cable wire, pipe, duct or other elements that pass through one or both outer surfaces of a fire-rated floor, wall or partition.
   2. These requirements for penetrations shall apply whether or not sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved, firestop annular space, if any, between sleeve and wall opening.

C. Provide firestopping to fill miscellaneous voids and openings in fire-rated construction as specified herein.

D. Provide intumescent moldable pads over backs and sides of all electrical junction and utility boxes at fire rated walls.

3.2 EXAMINATION

A. Verify site conditions under provisions of Division 01.

B. Verify openings are ready to receive the work of this Section.

3.3 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material or other matter that may affect bond of firestopping material.

B. Remove incompatible materials that may affect bond.

C. Install noncombustible backing materials to arrest liquid material leakage.

D. Examine the areas and conditions where firestops are to be installed and notify Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected by Contractor in a manner acceptable to Architect.

E. Verify penetrations are properly sized and in suitable condition for application of materials.

F. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

G. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

3.4 INSTALLATION

A. General:

1. Installation of firestops shall be performed by an applicator/installer qualified and trained by the manufacturer. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures. Written verification of the manufacturer's training shall be submitted to Architect.
2. Apply firestops in accordance with fire test reports, fire resistance requirements, acceptable sample installations, manufacturer's recommendations, and listing descriptions.
3. Provide sprinkler piping with NFPA 13 required annular space using firestop to allow movement.
4. Coordinate with plumbing, mechanical, electrical and other trades to assure that all pipe, conduit, cable and other items which penetrate fire-rated construction have been permanently installed prior to installation of firestops.
5. All penetrations for pipes, conduits, tubing or other building service elements shall be installed below the head-of-wall joint such that the distance between the top of the wall and the top of the penetrant is a minimum of 3 inches, no exceptions.

B. Regulatory Requirements: Install firestop materials in accordance with published "Through-Penetration Firestop Systems" in UL's Fire Resistance Directory.

C. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration materials.

1. Seal all holes or voids made by penetrations to ensure an air- and water-resistant seal.
2. Protect materials from damage on surfaces subjected to traffic.

D. Field Quality Control:

1. Prepare and install firestopping systems in accordance with manufacturer's printed instructions and recommendations.
2. Follow safety procedures recommended in the Material Safety Data sheets.
3. Finish surfaces of firestopping which are to remain exposed in the completed work to a uniform and level condition.
4. All areas of work must be accessible until inspection by the applicable Code authorities.
5. Correct unacceptable firestop installations and provide additional inspection to verify compliance with this Section at no additional cost.
6. All firestop assemblies shall be identified with a permanently affixed ID label as follows:
    a. Firestop System Warning Label: Minimum 3 inch by 5 inch label, red color or with red colored type and "WARNING: THROUGH PENETRATION FIRESTOP SYSTEM – DO NOT DISTURB. NOTIFY BUILDING MANAGEMENT OF ANY DAMAGE" written in bold type. Label shall be adhesive backed or provide other means of permanent attachment. Identified or included spaces for the following information:
        1) Name of manufacturer.
        2) Name of Installer.
        3) Date firestop system was installed.
        4) Firestop System UL number or manufacturer's engineered design number.
        5) F Rating and/or T Rating, as applicable.
7. All fire-rated wall assemblies shall be identified with signs or by stenciling in accessible concealed floor, floor-ceiling, or attic spaces at intervals not exceeding 30 feet and within 15 feet of the end of each wall per CBC Section 703.5. Lettering shall be not less than 3 inches in height with a minimum 3/8 inch stroke in contrasting color, incorporating the appropriate wording such as: "FIRE AND/OR SMOKE BARRIER-PROTECT ALL OPENINGS", with the relevant hourly fire resistance rating clearly stated.
8. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
9. Keep areas of work accessible until inspection by applicable code authorities.
10. Perform under this Section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

E. Installation shall be completed in a neat, workmanlike manner according to manufacturer's recommendations. Securely fasten and anchor insulation in place to prevent displacement or sagging of material. Safing insulation shall be adequately lapped.

F. Install material at fire rated horizontal to vertical assembly closures and at fire rated walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping.

G. Apply primer and materials in accordance with manufacturer's instructions.

H. Apply firestopping material in sufficient thickness to achieve rating.

I. Compress fibered material to achieve a density of forty percent of its uncompressed density.

J. Dam material to remain.

3.5 INSPECTIONS

A. Firestopping inspections shall meet the requirements of CBC Section 1705.18.

B. Inspection of completed work shall be performed by Authority Having Jurisdiction (AHJ) and/or the building underwriter's designee. If required by Authority Having Jurisdiction (AHJ) or underwriter, inspections may be performed by an independent, third-party construction inspection and testing service provided that:

1. Inspections are performed to the requirements of the following standards as applicable:
   a. Construction Joints: ASTM E2393.
   b. Service Penetrations: ASTM E2174.
2. Individual(s) performing inspection shall provide evidence of valid Errors and Omissions Insurance coverage for this service.
3. Individual(s) performing inspection shall not have any financial connection to installer, firestop manufacturer, distributor or supplier.

3.6 CLEANING

A. Clean Work under provisions of Division 01.

B. Clean adjacent surfaces of firestopping materials.

C. Remove spilled and excess materials adjacent to firestopping without damaging adjacent surfaces.

D. Leave finished work in a neat and clean condition with no evidence of spillovers or damage to adjacent surfaces.

3.7 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Division 01.

B. Protect adjacent surfaces from damage by material installation.

C. Where firestopping is installed at locations which will remain exposed in the completed work, provide protection as necessary to prevent damage to adjacent surfaces and finishes, and protect as necessary against damage from other construction activities.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sealants.

B. Sealant accessories.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 06 41 00 – Architectural Wood Casework.

C. Section 07 13 26 – Self-Adhering Sheet Waterproofing.

D. Section 07 19 19 – Silicone Water Repellents.

E. Section 07 41 00 – Metal Wall Panels.

F. Section 07 62 00 – Sheet Metal Flashing and Trim.

G. Section 07 84 00 – Firestopping.

H. Section 08 11 13 – Hollow Metal Doors and Frames.

I. Section 08 41 13 – Aluminum-Framed Entrances and Storefronts.

J. Section 08 81 00 – Glass Glazing.

K. Section 08 91 19 – Fixed Louvers.

L. Section 09 29 00 – Gypsum Board.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM C510 – Standard Test Method for Staining and Color Change of Single or Multicomponent Joint Sealants.
2. ASTM C719 – Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
3. ASTM C794 – Standard Test Method for Adhesion in Peel of Elastomeric Joint Sealants.

4. ASTM C834 – Standard Specification for Latex Sealants.
5. ASTM C881 – Standard Specification for Epoxy Resin Base Bonding Systems for Concrete.
6. ASTM C919 – Standard Practice for Use of Sealants in Acoustical Applications.
7. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
8. ASTM C1087 – Standard Test Method for Determining Compatibility of Liquid Applied Sealants with Accessories Used in Structural Glazing Systems.
9. ASTM C1193 – Standard Guide for Use of Joint Sealants.
10. ASTM C1248 – Standard Test Method for Staining of Porous Substrate by Joint Sealants.
11. ASTM C1311 – Standard Specification for Solvent Release Sealants.
12. ASTM C1521 – Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
13. ASTM D2203 – Standard Test Method for Staining from Sealants.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data: Submit manufacturer's descriptive literature and product specification for each product, including primers and sealing compounds.

C. Samples: Submit three cured samples of exposed sealants for each type and color to be installed.

D. Quality Assurance/Control Submittals:
   1. Product validation/assurance submittals.
   2. Manufacturer's laboratory adhesion and stain testing results.
   3. Joint sealants field adhesion to joint substrates test results.
   4. Installer qualifications.
   5. Written certification from the subcontractor that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will properly perform to provide permanent watertight, airtight or vapor tight seals (as applicable), and that materials supplied meet specified performance requirements.

E. Sample Manufacturer's Warranty.

F. Closeout Submittals: Cleaning and maintenance data.

1.5 DEFINITIONS

A. Sealant Types:
   1. S: Single component sealant, cures by moisture reaction.
   2. M: Multiple component sealant; cures by chemical reaction.

B. Sealant Grades:

1. NS: Non-sag or gunnable sealant that permits application in joints on vertical surfaces without sagging or slumping.
2. P: Pourable sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
3. SL: Self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.

C. Sealant Classes:

1. 12.5: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase and decrease of at least 12.5 percent of the joint width as measured at the time of application.
2. 25: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase and decrease of at least 25 percent of the joint width as measured at the time of application.
3. 35: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase and decrease of at least 35 percent of the joint width as measured at the time of application.
4. 50: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase and decrease of at least 50 percent of the joint width as measured at the time of application.
5. 100/50: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase of at least 100 percent and a decrease of at least 50 percent of the joint width as measured at the time of application.

D. Sealant Uses:

1. A: Sealant acceptable for use on an aluminum substrate.
2. G: Sealant acceptable for use on a glass substrate.
3. I: Sealant designed for use in joints which are submerged continuously in a liquid.
   a. Immersion rated sealant applications require primer.
4. M: Sealant acceptable for use on a mortar substrate.
5. NT: Sealant designed for use in joints in non-traffic areas.
6. T: Sealant designed for use in joints in pedestrian and vehicular traffic areas such as walkways, plazas, decks, and parking garages.
7. O: Sealant acceptable for use on substrates other than those listed above including, but not limited to, color anodized aluminum, metals other than aluminum, painted surfaces, brick, stone, tile, and wood.

E. Miscellaneous:

1. FC: Fast cure sealants; provides lesser cure times than corresponding standard cure sealants.

1.6 SUSTAINABLE DESIGN REQUIREMENTS

A. Meet VOC requirements of South Coast Air Quality Management District (SCAQMD) Rule 1168. Information is available at www.aqmd.gov. VOC limit expressed in grams per liter as follows:

Sealant	VOC Limit
Architectural	250
Roadways	250
Single Ply Roof Material Installation/Repair	450
Nonmembrane Roof Installation/Repair	300
Other	420

Sealant Primer	VOC Limit
Architectural – Nonporous	250
Architectural - Porous	775
Other	750

B. Provide sealants with no carcinogen or reproductive toxicant components at more than one percent of total mass of product as defined in the following lists:

1. California OEHHA, Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Information is available at www.oehha.ca.gov/prop65.html.
2. California Air Resources Board (CARB), list of Toxic Air Contaminants (California Air Toxics). Information is available at www.arb.ca.gov/toxics.

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section.
2. Applicator Qualifications: Firm specializing in installing work specified in this Section with experience on at least five projects of similar nature in past three years.

B. Product Validation/Assurance: Provide products with current SWRI Validation or provide independent third-party laboratory test results showing product meets performance requirements in accordance with ASTM C920 and as specified in this Section.

C. Compatibility: Materials forming joints and adjacent materials shall not adversely affect sealant materials or sealant color per ASTM C1087.

D. Staining: Sealants shall not stain joint substrates per ASTM C510, ASTM C1248, and ASTM D2203.

E. Manufacturer Adhesion, Cohesion, and Stain Testing: Provide manufacturer's laboratory adhesion and cohesion testing per ASTM C719 and ASTM C794, and stain testing per ASTM C510, using specimens of actual substrates to ensure sealant compatibility with substrate before product acceptance.

F. Joint Sealants Field Test for Adhesion and Cohesion to Joint Substrates: Perform field tests for each elastomeric joint sealant in accordance with ASTM C1521, with the manufacturer's representative present prior to installation as follows:

1. Install joint sealants in five foot joint lengths. Allow sealant to fully cure before testing.
2. Make a knife cut of the sealant across the joint and along each side of the joint approximately 3 inches long.
3. Place a mark on the sealant tab, 1 inch from the adhered joint to the tab's free end.
4. Grasp a 2 inch piece of sealant firmly just beyond the 1 inch mark and pull at a 90 degree angle.
5. Record whether or not sealant in joint maintained adhesion to substrate.
6. Record percentage length of sealant elongation.
7. Sealant product acceptance shall be based on pass/fail adhesion performance.

G. Coordination and Pre-Installation Meetings:

1. Conduct pre-installation meeting in accordance with provisions of Division 01.
2. Convene pre-installation meeting prior to commencing work of this Section.
3. Take minutes of meeting. Distribute to all attendees and concerned parties within five days.
4. Coordinate work in this Section with work in related Sections.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver materials in the unopened, original containers or unopened packages with manufacturer's name, labels, product identification, color, expiration period, curing time and mixing instructions for multi-component materials.

C. Storage and Protection: Store materials in a dry secure location with ambient temperature range of 60 degrees F to 80 degrees F.

D. Carefully handle and store to prevent inclusion of foreign materials.

1.9 PROJECT/SITE CONDITIONS

A. Environmental Limitations:

1. Do not proceed with installation of primers and joint sealants under the following conditions:
   a. When ambient and substrate temperature conditions are less than 40 degrees F, or as otherwise recommended by manufacturer.
   b. When joint substrates are wet.

B. Joint-Width Conditions:

1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.10 SEQUENCING

A. Apply waterproofing, water repellents, and preservative finishes after sealants have fully cured.

1.11 WARRANTY

A. Comply with provisions of Division 01.

B. Provide manufacturer's warranty against material defects, air and water tightness, loss of adhesion, cohesion, and staining as follows:

1. Silicone sealants – Twenty years.
2. Urethane sealants – Five years.
3. Security sealants – Five years.
4. Other sealants – Two years.

C. Provide installer's two year workmanship warranty.

1.12 MAINTENANCE DATA

A. Submit in accordance with Division 01.

B. Provide cleaning and maintenance information, recommended inspection intervals, and instructions for repairing and replacing failed sealant joints.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. BASF Corporation – Building Systems, Shakopee, MN; 800-433-9517 www.buildingsystems.basf.com.
2. GCP Applied Technologies, Cambridge, MA; 617-876-1400, www.gcpat.com.
3. GE Silicones, Huntersville, NC; 951-201-2000, www.gesilicones.com.
4. Pecora Corporation, Harleysville, PA; 800-523-6688, www.pecora.com.
5. Sika Corporation, Lyndhurst, NJ; 800-933-7452, www.usa.sika.com.
6. Specified Technologies Inc. (STI), Somerville, NJ; 800-992-1180, www.stifirestop.com.
7. The Dow Chemical Company, Midland, MI; 800-331-6451, www.consumer.dow.com.
8. The Euclid Chemical Company, Cleveland, OH; 800-321-7628, www.euclidchemical.com.
9. Tremco Sealant Weatherproofing Division of RPM International, Inc., Beachwood, OH; 800-321-7906, www.tremcosealants.com.
10. USG – United States Gypsum Co., Chicago, IL; 800-874-4968, www.usg.com.

B. Substitutions: Under provisions of Division 01.

2.2 SEALANTS

A. General:

1. Provide sealants that have been tested and found suitable for the substrates to which they will be applied.
2. Color: As selected by Architect from manufacturer's full range of colors.

B. Exterior Sealants:

1. Exterior Perimeter Sealant: Polyurethane sealant; ASTM C920; Type M; Grade NS; Class 50; uses: A, I, M, NT, O, T.
   a. Products:
      1) Tremco Dymeric 240FC.
      2) BASF MasterSeal NP2.
      3) Sika Sikaflex-2c NS.
      4) or accepted equal.
   b. Use at exterior vertical joints bordered on one or both sides by:
      1) Porous materials such as concrete or masonry.
      2) Non-porous materials such as painted metal, anodized or mill finish aluminum.
2. Exterior Perimeter Sealant: Ultra-low modulus moisture curing, non-staining, non-bleeding silicone sealant; ASTM C920; Type S; Grade NS; Class 50/50; uses: A, G, M, NT, O.
   a. Products:
      1) The Dow Chemical Company Dowsil 795 Silicone Building Sealant.
      2) Tremco Spectrum 2.
      3) Sika Sikasil WS-295.
      4) or accepted equal.
   b. Use at:
      1) Exterior vertical joints bordered on one or both sides by concrete, metal, and/or window perimeters, threshold bedding, and/or sheet metal flashing lap joints.
3. Silicone Weather Barrier Sealant: High performance, moisture curing, gun grade silicone sealant; ASTM C920; Type S; Grade NS; Class 25; use: A, I, M, NT, O, T.
   a. Products:
      1) The Dow Chemical Company Dowsil 758.
      2) GCP Applied Technologies S100.
      3) Tremco Spectrum 1.
      4) or accepted equal.
   b. Use for sheet metal flashing and trim over self-adhering sheet waterproofing, and sealing reverse laps and exposed or cut self-adhering sheet waterproofing membrane edges not exposed to UV.

4. Glazing Sealant: Medium modulus, neutral curing, non-staining, non-bleeding silicone sealant; ASTM C920; Type S; Grade NS; Class 50; uses: A, G, M, NT, O.
    a. Products:
        1) Tremco Spectrem 2.
        2) The Dow Chemical Company Dowsil 795 Silicone Building Sealant.
        3) GE Silicones SilPruf SCS2000.
        4) Pecora 895NST.
        5) Sika Sikasil WS-295.
        6) or accepted equal.
    b. Use at exterior joints in window wall systems such as glass to glass, glass to metal, and metal to metal joints.
5. Traffic Sealant: Self leveling, chemical curing, non-staining, non-bleeding polyurethane sealant; ASTM C920; Type M; Grade NS or Grade P; Class 25; uses: M, O, T.
    a. Products:
        1) Tremco THC900.
        2) Pecora Corp. Urexpan NR-200.
        3) BASF MasterSeal SL 2.
        4) Sika Sikaflex-2c SL.
        5) or accepted equal.
    b. Use at:
        1) Exterior horizontal traffic expansion joints in concrete with slopes less than five percent.
        2) Interior horizontal traffic joints in low-slope concrete with slopes less than five percent.
6. Metal Lap and Bedding Sealant (non-soldered flashings): Non-drying, non-skinning, non-curing flexible butyl rubber sealant; ASTM C1311; Type S; Grade NS; Class 10; uses: G, M, O.
    a. Products:
        1) Tremco Butyl Sealant.
        2) Pecora Corp. BA-98 Butyl Rubber Sealant.
        3) or accepted equal.
    b. Use for bedding thresholds, glazing secondary seals, and sheet metal flashing and trim not exposed to ultraviolet (UV) light.
7. Metal Lap and Bedding Sealant (non-soldered flashings): High performance, moisture curing, gun grade polyurethane sealant; ASTM C920; Type S; Grade NS; Class 25; use: A, I, M, NT, O, T.
    a. Products:
        1) Tremco Vulkem 116.
        2) BASF MasterSeal TX1.
        3) Sika Sikaflex Textured Sealant.

4) or accepted equal.

b. Use for bedding thresholds, glazing secondary seals, and sheet metal flashing and trim exposed to ultraviolet (UV) light.

C. Interior Sealants:

1. Interior Sealant: Nonoxidizing, skinnable, paintable, gunnable, non-staining, non-bleeding acrylic latex sealant; ASTM C834; Type S; Grade NS; Class 12.5; use: O.
   a. Products:
      1) Tremco Tremflex 834.
      2) Pecora Corp. AC-20 + Silicone.
      3) or accepted equal.
   b. Use at interior trim and finish joints expecting minimal movement.
2. Interior Sealant: Low modulus, moisture curing, non-staining, non-bleeding polyurethane sealant; ASTM C920; Type S; Grade NS; Class 35; uses: A, M, NT, O.
   a. Products:
      1) Tremco Dymonic FC.
      2) Euclid Chemical Company Eucolastic 1NS.
      3) Sika Sikaflex 1a.
      4) or accepted equal.
   b. Use at interior vertical expansion, control, and air seal joints.
3. Sanitary Sealant: Mildew resistant with fungicide, acetoxy curing, non-staining, non-bleeding silicone sealant; ASTM C920; Type S; Grade NS; Class 25; uses: A, G, NT, O.
   a. Products:
      1) Tremco Tremsil 200 Sanitary.
      2) The Dow Chemical Company Dowsil 785 Mildew Resistant.
      3) GE Silicones Sanitary SCS 1700.
      4) Pecora 898NST.
      5) Sika Sikasil-N Plus US.
      6) or accepted equal.
   b. Use at interior joints with nonporous substrates around ceramic tile, showers, sinks and plumbing fixtures.
4. Acoustical Sealant: Non-skinning, non-hardening synthetic rubber sealant; ASTM C919; Type S; Grade NS; use: O.
   a. Products:
      1) Tremco Acoustical Sealant.
      2) Pecora BA-98.
      3) or accepted equal.
   b. Use at concealed joints and penetrations in interior acoustical walls.

5. Acoustical Sealant: Nonoxidizing, skinnable, paintable, gunnable, non-staining, non-bleeding acrylic latex sealant; ASTM C834 and C919; Type S; Grade NS; Class 12.5; use: O.
    a. Products:
        1) Tremco Tremflex 834.
        2) Pecora Corp. AC-20 FTR.
        3) USG Sheetrock Brand Acoustical Sealant.
        4) STI SpecSeal Smoke “N” Sound Sealant.
        5) or accepted equal.
    b. Use at exposed joints and penetrations in interior acoustical walls.
6. Security Sealant: 100 percent solids, moisture tolerant, low-modulus, non-sag, paste-consistency epoxy resin binder sealant; ASTM C881, Type M; Grade NS; use: A, M, NT, O.
    a. Products:
        1) Sika Sikadur-23 Security Sealant.
        2) BASF MasterEmaco ADH 327.
        3) or accepted equal.
    b. Use at all horizontal and vertical joints in exposed areas subject to contact by inmates including, but not limited to, the following:
        1) Detention doors and frames.
        2) Detention furnishings and accessories.
        3) Security plumbing and electrical fixtures.
        4) Exposed decking and deck seams/joints.
        5) Seams in cells.
        6) Security electronic devices.
        7) Access doors and panels.
7. Security Sealant: Solvent-free, moisture tolerant, flexible epoxy control joint sealant and adhesive; ASTM C920; Type M; Grade NS; use: A, M, NT, O.
    a. Products:
        1) Sika Sikadur-51 Security Sealant.
        2) BASF MasterEmaco CR 190.
        3) or accepted equal.
    b. Use at all horizontal and vertical joints in exposed areas subject to contact by inmates including, but not limited to, the following:
        1) Wall to decking intersections.
        2) Concrete masonry unit control joints at interior locations.
        3) Pass through transaction units.

2.3 ACCESSORIES

A. Joint Cleaner: Non-corrosive and non-staining type as recommended by sealant manufacturer; compatible with joint forming materials.

B. Primers: Non-staining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.

C. Joint Backing: Non-adhering backing to sealant; non-staining, compatible with sealant and primer such as round, closed cell or bi-cell polyethylene foam rod; oversized 25 percent to 50 percent larger than joint width. Materials impregnated with oil, bitumen or similar materials are not permitted.

D. Bond Breakers: Type and consistency recommended by the sealant manufacturer to suit the particular application.

E. Bond Breaker Tape: Self-adhesive, pressure sensitive polyethylene tape.

F. Masking Tape: Non-staining, non-absorbent tape compatible with joint sealants and adjacent joint surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine job site conditions; verify substrate, surfaces, and joint openings are ready to receive work and field measurements are as shown on drawings, as specified in this Section, and as recommended by manufacturer.

B. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 PREPARATION

A. Clean, prepare, and prime joints in accordance with ASTM C1193 and manufacturer's written instructions.

B. Remove loose materials and foreign matter that might impair sealant adhesion. Clean porous materials such as concrete or masonry by grinding, sand or water blast cleaning, mechanical abrading, acid washing or a combination of these methods as required to provide a clean, sound base surface for sealant adhesion.

1. Remove laitance by acid washing, grinding or mechanical abrading.
2. Remove form oils, release agents, chemical retardants, by sand or water blast cleaning.
3. Blow from joints with oil-free compressed air loose particles resulting from grinding, abrading, or blast cleaning prior to sealant application.
4. Do not apply sealant to masonry joints where water repellent or masonry preservative has been applied. Apply water repellents or waterproofing treatments after sealants have fully cured. Coordinate with Section 07 19 19.

C. Mechanically or chemically clean nonporous surfaces such as metal and glass. Remove temporary protective coatings on metallic surfaces using solvents that leave no residue as recommended by metal surface manufacturer. When masking tape or strippable films are used, remove the tape or film and clean any residual adhesive. Apply and wipe-dry cleaning solvents using clean, lint-free cloths or paper towels, do not allow solvent to air dry without wiping.

D. Protect elements surrounding the work of this Section from damage or disfiguration. Apply masking tape to adjacent surfaces to prevent damage to finishes from sealant installation.

3.3 APPLICATION

A. Apply sealants in accordance with ASTM C1193, manufacturer's written instructions, and accepted shop drawings.

B. Apply acoustical sealants in accordance with ASTM C919, manufacturer's written instructions, except where more stringent requirements are specified herein, and accepted shop drawings.

C. Application of Security Sealants:

1. Install security sealants per manufacturer's recommendations.
2. Minimum substrate and ambient temperature shall be 40 degrees F at time of application.
3. Concrete and masonry substrates must be tested for moisture-vapor transmission prior to application.
4. Minimum age of concrete and masonry before application shall be 28 days. However, it is recommended that concrete and masonry substrates attain an age of 60 days to 90 days prior to application.

D. Apply sealant where indicated on the Drawings and at all exterior joints and openings in the building envelope that are observable sources of air or water infiltration.

E. Measure joint dimensions and size materials to achieve required width-to-depth ratios. Acceptable joint width-to-depth ratios:

Material	Joint Width	Joint Depth	
		Minimum	Maximum
Metal or other nonporous surfaces.	1/4 inch (minimum)	1/4 inch	1/4 inch
	Over 1/4 inch	1/2 of width	Equal to width
Wood, concrete, or other porous surfaces.	1/4 inch (minimum)	1/4 inch	1/4 inch
	Over 1/4 inch	1/2 of width	Equal to width
	Over 1/2 to 2 inches	1/2 inch	1/2 inch
	Over 2 inches	As recommended by sealant manufacturer.	

F. Install joint backing to achieve desired joint width-to-depth ratio. Roll the material into the joint to avoid lengthwise stretching. Do not twist or braid rod stock.

G. Install bond breaker where joint backing is not used to prevent three-sided adhesion.

H. Apply primer where required and where recommended by sealant manufacturer for sealant adhesion.

I. Install sealants within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

J. Install sealants immediately after joint preparation.

K. Install sealants free of air pockets, foreign embedded matter, ridges, and sags.

L. Produce uniform, cross sectional shapes and depths relative to joint width that allow optimum sealant movement capability.

M. Tool joints concave. Use dry tooling method.

N. Cure sealants in compliance with their manufacturer's instructions to obtain high early bond strength, internal cohesive strength, and durability. Do not disturb seals until completely cured.

3.4 CLEANING AND REPAIRING

A. Immediately clean work under provisions of Division 01.

B. Clean adjacent soiled surfaces. Use a cleaning agent as recommended in writing by the sealant manufacturer. Remove any masking tape immediately after tooling joints, leaving finished work in neat and clean condition.

C. Repair or replace defaced or disfigured caused by work of this Section.

3.5 PROTECTION OF FINISHED WORK

A. Protect finished installation under provisions of Division 01.

B. Protect sealant until cured.

C. Do not paint sealants until sealant is fully cured.

D. Do not paint silicone sealant.

E. Protect joint sealants from contact with contaminating substances and from damage. Cut out, remove and replace contaminated or damaged sealants, immediately, so that they are without contamination or damage at time of Project Completion.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Standard hollow metal doors and frames.
   1. Hollow metal doors, rated and non-rated.
   2. Hollow metal frames, rated and non-rated.

B. Borrowed lights (interior windows, fixed).

C. Sidelights.

D. Transoms.

E. Door glazing.

F. Door louvers Security door louvers.

G. Finish: Field-painted, color as indicated on Drawings; if not indicated, to be selected by Architect. Provide exterior paint system on both interior and exterior faces, four edges, and frames of exterior doors.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 05 40 00 – Cold-Formed Metal Framing.

C. Section 07 25 00 – Weather Barriers.

D. Section 07 92 00 – Joint Sealants.

E. Section 08 14 00 – Wood Doors.

F. Section 08 71 00 – Door Hardware.

G. Section 08 81 00 – Glass Glazing.

H. Section 08 88 13 – Fire Rated Glazing.

I. Section 09 22 16 – Non-Structural Metal Framing.

J. Section 09 29 00 – Gypsum Board.

K. Section 09 91 00 – Painting.

L. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ANSI/SDI A250.6 – Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
2. ANSI/SDI A250.8 – Standard Steel Doors and Frames.
3. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. ASTM A1008/A1008M – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
5. ASTM A1011/A1011M – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
6. ASTM C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
7. ASTM E283 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
8. ANSI/NAAMM HMMA 861 – Guide Specifications for Commercial Hollow Metal Doors and Frames.
9. California Building Code, Section 716 “Opening Protectives,” Paragraph 716.5 “Fire Door and Shutter Assemblies”.
10. NAAMM HMMA 840 – Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.
11. NFPA 80 – Standard for Fire Doors and Other Opening Protectives.
12. NFPA 105 – Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives.
13. NFPA 252 – Standard Methods of Fire Tests of Door Assemblies.
14. NFPA 257 – Standard on Fire Test for Window and Glass Block Assemblies.
15. NFRC 400 – Procedure for Determining Fenestration Product Air Leakage.
16. UL 9 – Standard for Safety Fire Tests of Window Assemblies.

17. UL 10B – Fire Tests of Door Assemblies.
18. UL 10C – Positive Pressure Fire Tests of Door Assemblies.
19. UL 1784 – Air Leakage Tests for Door Assemblies.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Include illustrations and schedule of finish hardware, door and frame size, type, material, fire ratings, construction, finishing, anchoring, glazing, louvers, accessories, and preparation for installing hardware.

1. Method of attachment of frames to structure shall be reviewed by Architect for acceptance or rejection.
2. Details of conduit and preparations for power, signal, and control systems.

C. Templates: Furnish hardware templates to fabricator of frames to be factory prepared for installation of hardware. Refer to Section 08 71 00 for hardware requirements.

D. Submit product data for type of metal primer proposed for use.

1.5 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.6 QUALITY ASSURANCE

A. Steel door and frame manufacturer shall be SDI certified.

B. Provide doors and frames complying with ANSI A250.8, ANSI/NAAMM-HMMA 861, and as specified herein.

1.7 REGULATORY REQUIREMENTS

A. Fire-Rated Doors and Frames: Provide doors and frames complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
2. Temperature-Rise Limit: At exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 degrees F above ambient after thirty minutes of standard fire-test exposure.

B. Testing of Fire-Rated Door and Frame Assembly: Conform to applicable requirements of NFPA 252 or UL 10C.

C. Doors and Frames for Smoke-Control Door Assemblies: Comply with applicable requirements of NFPA 105 or UL 1784.

D. Fire-Rated Door and Frame Labels: All fire rated doors and frames shall have metal labels (including “S” labels) permanently fastened to the jamb indicating the fire rating and Testing Agency name.

1. Do not apply primer or paint over fire rating labels.

E. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

F. Door assemblies shall meet air infiltration requirements of California Energy Code, California Code of Regulations, Title 24, Part 6, Section 110.6, as referenced in California Building Code, Chapter 13, “Energy Efficiency”.

1. Air Leakage Limits: Manufactured exterior door assemblies shall have air infiltration rates not exceeding 0.3 cubic feet per minute per square foot of door area for nonresidential single doors (swinging and sliding), and 1.0 cubic feet per minute per square foot for nonresidential double doors (swinging), when tested according to NFRC 400 or ASTM E283 at a pressure differential of 75 pascals or 1.57 pounds per square foot.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials under protective cover and store in upright position within a dry enclosed space in a manner that will prevent rust and damage. Do not create a humidity chamber by using a plastic or canvas shelter that is not adequately vented.

B. Deliver fully-welded frames with two removable spreader bars across bottom of door frames, tack welded to jambs and mullions.

1.9 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.10 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.11 WARRANTY

A. For a period of one year from the date of delivery to the original direct purchaser, manufacturer warrants to the original direct purchaser that it will at its option, either repair, replace or otherwise correct any product acknowledged by the manufacturer to be defective in materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers, Hollow Metal Doors and Frames:
   1. Ceco Door Products, Milan, TN; 888-232-6366, www.cecodoor.com.
   2. Curries Company, Mason City, IA; 800-377-3948, www.curries.com.
   3. Steelcraft, Cincinnati, OH; 877-671-7011, www.steelcraft.com.
   4. Door Components Inc., Fontana, CA; 866-989-3667, www.doorcomponents.com.

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Cold-Rolled Steel Sheets for Doors and Frames: Commercial Steel (CS), Type B, complying with ASTM A1008/A1008M.
   1. Use cold-rolled steel for door frames and exposed-to-view surfaces.

B. Hot-Rolled Steel Sheets and Strip for use at Door Frames: Commercial Steel (CS), Type B; complying with ASTM A1011/A1011M.
   1. Steel shall be free of mill scales, pitting, or surface defects; pickled and oiled.
   2. Use hot-rolled steel for reinforcement and concealed components only.

C. Factory-Applied Primer: Manufacturer's standard primer, thickness: two mils minimum, and compatible with ferrous and galvanized metal primers specified in Section 09 91 00.

D. Refer to Section 08 81 00 and Section 08 88 13 for glass glazing requirements.

E. Refer to Section 08 71 00 for hardware requirements.

2.3 STANDARD HOLLOW METAL DOOR FABRICATION

A. General: Fabricate to sizes shown, providing necessary clearances and bevels to permit operation without binding. Doors shall be free from warp, wave, buckle or other defect. Doors shall be 1-3/4 inches thick, unless otherwise indicated on Drawings.

B. Flush Door Construction: Door shall be Grade III, Model 2, fabricated with face sheets of 16 gauge steel in accordance with ANSI/SDI A250.8 and galvannealed to ASTM A653/A653M A60 at exterior locations and interior wet locations. Door shall be flush with edge seams, weld filled and ground smooth. Bevel lock edge 1/8 inch in 2 inches. Door shall be provided with 16 gauge steel top flush cap welded and ground smooth, and bottom inverted 14 gauge steel channels welded within the door. Door shall be reinforced, stiffened, and sound deadened with impregnated kraft honeycomb core completely filling door cavity, and laminated to the inside faces of panels.
   1. Exterior doors shall be insulated with an expanded polystyrene or polyurethane core, or as standard with manufacturer. Completely fill door cavity with insulation. Expanded polystyrene to be ASTM C578, Type 1 or Type 2, with minimum one pound per cubic foot density.

C. Preparation of Hardware: Per ANSI/SDI A250.6, door shall be mortised, reinforced, drilled and tapped at the factory from templates for all mortise hardware listed in the Hardware Schedule. Door shall be reinforced for surface applied hardware such as closers, checks, escutcheons and kick plates; drilling and tapping to be done in the field by door installer. Reinforcement to be 12 gauge for locksets and latchsets, and 14 gauge for surface applied hardware, except use 3/16-inch thick plate for butt hinges. Door shall be provided with reinforcing unit as recommended by lock manufacturer.

D. Hardware Mounting Heights and Door Clearances: In accordance with California Building Code and applicable requirements of Section 08 71 00.

2.4 STANDARD HOLLOW METAL FRAME FABRICATION

A. General:

1. Provide fully-welded frames.
2. Hollow metal frames shall be formed to shapes and sizes shown.

B. Full Profile Welded Frames: Head and jamb splices shall be fabricated with mitered, coped and continuously welded inside and outside corners and be finished on the outside face to present a smooth surface for painting.

C. Frames shall be fabricated from 16 gauge steel, and shall be designed with integral stop and trim. All corners shall be reinforced with 18 gauge “L” shaped reinforcements welded on the inside face of the frame.

D. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.

E. Frames shall be galvannealed to ASTM A653/A653M A60 at exterior locations and interior wet locations.

F. Where the solid grouting of frames is required, provide top openings and jamb to mullion openings to facilitate the solid grouting of frames.

G. Preparation for Hardware: Per ANSI/SDI A250.6, frame shall be prepared at the factory for all hardware using templates furnished by hardware supplier. Locations of miscellaneous hardware shall conform to the recommendations for the Door and Hardware Institute. Mortise, reinforce, drill and tap for mortise type hardware. Reinforce frames for surface applied hardware; drilling and tapping to be done in the field by door installer.

1. Hardware cutouts shall have steel plate reinforcements with tapped holes fillet welded to frame on all four sides of the plate. Fillet welds shall be minimum 1 inch long. Reinforcement shall include 3/16 inch butt reinforcement; 12 gauge lock strike; 14 gauge for surface applied items.
2. Provide strike stops at frames to receive hollow metal and wood doors with holes for three rubber door silencers. On double door frames, provide for two silencers per door at head. Omit holes at frames to receive unitized gasketing; refer to Section 08 71 00.

2.5 BORROWED LIGHTS (INTERIOR WINDOWS, FIXED)

A. Interior Window Units: Furnish shop assembled and fully welded units for fixed windows, fabricated to the designs and dimensions indicated. Provide metal glazing stops and mouldings of same gauge as frame on secure side of window for field assembly with countersunk oval head self-tapping screws spaced not over 16 inches on center. Frames shall be complete with all corners welded, ground smooth, and provided with anchors.

2.6 ANCHORS

A. Frame shall be anchored to structure with anchors appropriate for use with type of adjacent construction. Anchorage shall securely fasten frames to wall construction involved. Provide a minimum three anchors, including one adjustable floor clip, at each door jamb. Frames taller than eight feet in height will require additional anchors at each jamb. Anchors shall be minimum 16 gauge steel and shall provide stiffness and rigidity to keep frames square, in accurate position without twisting, buckling or warping. Floor clips shall be anchored to the concrete slab using concrete screws by Hilti, Simpson, or accepted equal. Fasteners to wall framing substrate shall be the following minimums; greater as required by the frame manufacturer or as conditions warrant:

1. Metal Framing: Two #10 self-tapping sheet metal screws per anchor, length as required; fastener to penetrate a minimum of 1/4 inch into framing member.
2. Concrete/Masonry: 3/8 inch diameter loop anchors welded to 10 gauge steel plates. Refer to Drawings for size, location, and quantity.
3. Masonry: 12 gauge steel T anchors or wire clips, three per jamb.
4. Concrete/Masonry: 1/4 inch diameter stainless steel concrete screws, three per jamb, with 1-1/2 inches minimum embedment into substrate and 2 inches minimum edge distance to face of substrate. Concrete screws by Hilti, Simpson, or accepted equal.

2.7 PRIMING

A. Doors and frames shall be leveled and welds ground smooth. Apply mineral filler to eliminate weld scars and other blemishes.

B. Shop Priming: All surfaces shall be cleaned, phosphatized, and given one coat of baked-on rust-inhibiting primer in accordance with the Steel Door Institute Specification "Test Procedure and Acceptance Criteria for Primer Painted Steel Doors and Frames".

1. Do not prime paint over fire-rated door and frame labels.

2.8 ACCESSORIES

A. Glazing Stops: LoPro by Anemostat or Slimline by Air Louvers, Inc. Galvanized steel; mitered corners; prepared for countersink style screws. Sizes as indicated on Drawings. Install glazing stop fasteners on the non-secure side of doors. Finish shall be factory primed to receive site paint finish, color as selected by Architect.

1. At fire-rated assemblies, fire-rating of glazing stops shall match fire-rating of opening. Fire-rated glazing stops shall bear the listing mark of Underwriters Laboratories and/or Warnock Hersey, and shall be visible without removal of the frame from the door.

B. Glass Glazing: As specified in Section 08 81 00 and Section 08 88 13.

C. Non-Rated Door Louvers: AFDL by Anemostat or Model 800 A1 by Air Louvers, Inc. Fabricate from galvanized cold rolled steel sheet. Frame shall be 18 gauge and blades shall be 22 gauge. Permanent interlocking construction shall be used to secure blades to frame on stationary louvers. Frames shall have mitered and flush welded corners. Factory install screens, aluminum wire mesh. Louvers shall have fifty percent free area minimum; sizes as indicated on Drawings. Finish shall be factory primed to receive site paint finish, color as selected by Architect.

D. Fire-Rated Fusible Link Door Louvers: FLDL-W by Anemostat or Model 1900A by Air Louvers, Inc. Fire-rating of louver shall match fire-rating of opening. Fire-rated louvers shall bear the listing mark of Underwriters Laboratories and/or Warnock Hersey, and shall be visible without removal of the frame from the door. Fabricate from galvanized cold rolled steel sheet. Frames shall have mitered and flush welded corners. Factory install screens, aluminum wire mesh. Louvers shall have fifty percent free area minimum; size as indicated on Drawings. Finish shall be factory primed to receive site paint finish, color as selected by Architect.

E. Security Door Louvers: **Use when vandal-resistant door louvers are required. Ref. Project #28051 Center High School.**

1. Door Louvers: Provide heavy-duty, vandal-resistant door louvers with security grille; size as indicated on Drawings.
   a. Louvers with Grilles: Two-piece louver design; galvanized steel, G90 coating; 18 gauge inverted-Y louver blades; and 12 gauge security grille on both sides.
   b. Fasteners: Security fasteners, non-removable from secure side.
   c. Finish: Factory-applied primer, suitable for field painting.
   d. Free Area: Forty percent, minimum.
2. Basis-of-Design Product: Model 1500-A Security Louver by Air Louvers Inc., City of Commerce, CA; 800-766-0660, www.airlouvers.com or accepted equal by Anemostat Door Products (A Mestek Company), Carson, CA; 310-835-7500, www.anemostat.com.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that opening sizes and tolerances are acceptable.

3.2 INSTALLATION

A. Install doors and frames in accordance with ANSI A250.8, ANSI/NAAMM-HMMA 861, and UL 752, as applicable.

B. Set frames level and plumb, and brace adequately to prevent damage or distortion. Secure to structure with minimum of three anchors at each jamb. Field joints shall be welded, body puttied and ground smooth.

1. Removable Spreaders: Wherever possible, leave frame spreaders intact until frames are set perfectly square and plumb, and anchors are securely attached.

C. Door Installation in Hollow Metal Frames: Fit hollow metal and wood doors accurately in frames.

D. Door frames at sound dampened assemblies shall have the inside filled with **[fiberglass batt] [mineral wool]** acoustic insulation as specified in Section 09 81 00. Do not compress insulation.

E. Coordinate installation of doors and frames with installation of doors specified in Section 08 14 00, hardware specified in Section 08 71 00, and glazing as specified in Section 08 81 00 [and Section 08 88 13], and louvers as specified in this Section.

3.3 ERECTION TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.4 ADJUST AND CLEAN

A. Prime Coat Touch-Up: Immediately after erection, sand smooth all rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer. Touch-up shall not be obvious.

B. Cleaning and Finishing: Upon completion of the work, clean all exposed surfaces, removing any discoloration or foreign matter, and touch up all abraded or cut areas and exposed edges with finishing material recommended by the manufacturer. Touch-up of finish shall not be obvious.

C. Final Adjustments: Adjust door for smooth and balanced door movement. Check and readjust operating finish hardware in hollow metal work immediately prior to final inspection. Leave work in complete and proper operating condition.

D. Defective Work: Remove and replace defective work, including doors and frames which are warped, bowed or otherwise damaged, as directed by Architect, at no cost to Owner.

E. Protection: Protect installed hollow metal work against damage from other construction work.

3.5 CLEAN-UP

A. Upon completion of the work of this Section, remove all excess materials, rubbish, and debris from the premises.

END OF SECTION

SECTION 08 14 00

WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Rated and Non-Rated Flush Wood Doors.

B. Door Glazing.

1.2 RELATED SECTIONS

A. Section 08 11 13 – Hollow Metal Doors and Frames.

B. Section 08 71 00 – Door Hardware.

C. Section 08 81 00 – Glass Glazing.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ANSI/WDMA I.S.1-A – Architectural Wood Flush Doors.
2. ASTM F152 – Standard Test Methods for Tension Testing of Nonmetallic Gasket Materials.
3. California Building Code, Section 716 “Opening Protectives”, Paragraph 716.2 “Fire Door Assemblies”.
4. ITS Directory of Listed Products.
5. NFPA 80 – Fire Doors and Windows.
6. NFPA 252 – Standard Test Methods for Fire Door Assemblies.
7. UL 10C – Standard for Positive Pressure Fire Tests of Door Assemblies.
8. WI/AWMAC North American Architectural Woodwork Standards, including WI Supplemental Text.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, fire ratings, swings, undercuts required, special beveling, special blocking for hardware, and identify cutouts for glazing.

C. Product Data: Indicate door core materials and construction, veneer species and cut, type and characteristics, factory machining criteria, and factory finishing criteria.

D. Samples: Submit three sets of three samples each of door veneer, 8 inches x 8 inches in size, illustrating specified wood species, grain, and range of color.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: All doors specified in this Section shall be manufactured and provided by a single manufacturer to ensure door compatibility and quality.

B. Perform work in accordance with WI/AWMAC, Section 9, Custom Grade.

C. Other requirements shall conform to WDMA I.S. 1A-04 as follows:

Performance Attribute	Duty Level
	Extra Heavy Duty
Adhesive Bond Durability WDMA TM-6, 1988	Type I
Cycle Slam WDMA TM-7, 1990	1, 000,000 cycles
Hinge-Loading WDMA TM-8, 1990	550 pounds
Screwholding WDMA TM-10, 1990	
Door Face Unblocked	550 pounds
Door Face (with optional blocking)	700 pounds
Vertical Door Edge	550 pounds
Horizontal Door Edge (applies when hardware attached)	300 pounds
Telegraph WDMA T-1	Maximum 0.010 inch per 3-inch span
Warp Tolerance WDMA T-2	Maximum 0.25 inch per 3 foot 6 inches by 7 foot door section
Squareness WDMA T-3	Diagonal Variance 0.125 inch

1.6 REGULATORY REQUIREMENTS

A. Fire-Rated Wood Doors: Doors complying with 2022 California Building Code (CBC), Section 716 “Opening Protectives”, Paragraph 716.2 “Fire Door Assemblies”, and NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, as applicable.

B. Fire Door Construction: Conform to NFPA 252.

C. Fire-Rated Doors: All fire rated doors shall have metal labels (including “S” labels) permanently fastened to the hinge stile indicating the fire rating and Testing Agency name. Do not apply primer or paint over fire rating labels.

D. Composite Wood Products: Hardwood, plywood, particleboard, and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure (ATCM) for Composite Wood (17 CCR 93120 et seq.) Those materials not exempted under the ATCM must meet the specified emission limits, as shown in Table 5.504.4.5 of CALGreen.

1. Documentation shall be provided per CALGreen Section 5.504.4.5.3.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 01.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Comply with requirements in ANSI/WDMA I.S.1A: How to store, handle, finish, install and maintain wood doors.

D. In the event of damage, immediately make all repairs and replacements necessary at no additional cost to Owner.

E. Store flat on a level surface in a dry, well-ventilated building. Cover to keep clean but allow air circulation.

F. Handle with clean gloves and do not drag doors across one another or across other surfaces.

G. Do not subject door to abnormal heat, dryness or humidity.

H. Deliver in clean trucks and, in wet weather, under cover.

1.9 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.10 COORDINATION

A. Coordinate the work with door opening construction, doorframe, door hardware, and door glazing installation.

1.11 WARRANTY

A. Provide warranty under provisions of Division 01.

B. Warranty Period:

1. Interior Solid Core Standard Doors: Life of installation.

2. Include coverage for delamination of veneer, warping or twisting (not to exceed 1/4 inch in any face including diagonal) or other defects. Warranty shall cover replacement of door plus costs of hanging and finishing.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Oregon Door, Winston, OR; 541-679-6791, www.oregondoor.com.
   2. VT Industries, Holstein, IA; 800-827-1615, www.vtindustries.com.
   3. Lynden Door, Inc, Lynden, WA; 800-631-3667, www.lyndendoor.com.

B. Substitutions: Under provisions of Division 01.

2.2 DOOR CONSTRUCTION

A. All doors shall be 1-3/4 inch thickness, unless noted otherwise.

B. Solid, non-rated particleboard core: WI/AWMAC Section 9, 5-ply; Custom Grade.

C. Solid, 45-minute rated mineral core: WI/AWMAC Section 9. Stile edges shall be a minimum of 1 inch before trim on hinge side and 3/4 inch on lock side, including 1/4 inch outer edge band of hardwood.

D. Faces:
   1. Veneer Species: Stain grade select cherry veneer for transparent finish.
   2. Cut: Plain sliced.
   3. Grade: A Grade.
   4. Match between Veneer Leaves: Slip match.
   5. Assembly of Veneer Leaves on Door Faces: Balance match.
   6. Face veneers for pairs of doors shall be selected for color and grain match. Face veneers shall not be less than 1/50 inch at 12 percent moisture content after factory sanding. Crossbanding shall be one piece high density fiberboard (HDF), MDF will not be allowed as a veneer substrate (crossband). Thin veneers are not acceptable.
   7. Use solid stock for exposed edges to match face veneer.

E. Provide solid blocking on doors with surface mounted hardware or closers, for attachment with screws in lieu of through-bolts.

F. Top and bottom rails shall be a minimum of 2-1/4 inch before trimming, mill option species structural composite lumber for non-rated doors.

G. Fire Resistive Doors with 45 Minute or Longer Fire Ratings (positive pressure): Meet requirements of UL 10 (b)-80, and ASTM F152 for fire rating noted.

2.3 ADHESIVE

A. Facing Adhesive: Type I – waterproof.

2.4 ACCESSORIES

A. Glazing Stops: LoPro by Anemostat or Slimline by Air Louvers, Inc. Galvanized steel; mitered corners; prepared for countersink style screws. Sizes as indicated on Drawings. Install glazing stop fasteners on the non-secure side of doors. Factory paint finish in custom color as selected by Architect.

B. Glass Glazing: As specified in Section 08 81 00.

2.5 FABRICATION

A. Fabricate non-rated doors in accordance with WI/AWMAC North American Architectural Woodwork Standards requirements.

B. Provide blocking at top of door for closer for attachment with screws.

C. Bond edge banding to cores.

D. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.

E. Undercut doors where indicated on Drawings.

F. Glass Cutouts: Provide cutouts for glass of size and shape indicated. Glass for doors is specified under Section 08 81 00.

G. Factory seal top and bottom rails before shipment.

H. Bevel both stiles 1/8 inch in 2 inches (3 degree bevel) and undersize doors 1/4 inch in width so that they swing freely and do not hinge bind.

2.6 FINISH

A. All doors shall be factory pre-finished, equal to WI/AWMAC Section 5, System #3, or accepted equal. Transparent finish; custom stain color and tone as selected by Architect and accepted on submitted sample. Apply finish at all faces and edges of doors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify frame opening conditions.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

A. Install rated and non-rated doors in accordance with WI/AWMAC Section 9 requirements, and UL or Intertek Testing Services (ITS) requirements.

B. Pre-adjust door height, supply doors with factory undercut.

C. Where required, trim non-rated door width by cutting equally on both jamb edges.

D. Where required, trim door height by cutting bottom edge to a maximum of 1/2 inch above finished floor or threshold.

E. Pilot drill screw and bolt holes.

F. Machine cut for hardware. Core for handsets and cylinders.

G. Coordinate installation of doors with installation of frames specified in Section 08 11 13, hardware specified in Section 08 71 00, and glazing as specified in Section 08 81 00.

3.3 INSTALLATION TOLERANCES

A. Maximum Diagonal Distortion (Warp): 1/4 inch measured with straight edge or taut string, corner to corner, over an imaginary 36 inch x 84 inch surface area.

B. Maximum Vertical Distortion (Bow): 1/4 inch measured with straight edge or taut string, top to bottom, over an imaginary 36 inch x 84 inch surface area.

3.4 ADJUSTING

A. Adjust work under provisions of Division 01.

B. Adjust door for smooth and balanced door movement, and wipe clean.

END OF SECTION

SECTION 08 31 00

ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Rated and non-rated access door and frame units in wall and ceiling locations.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 09 22 16 – Non–Structural Metal Framing.

C. Section 09 29 00 – Gypsum Board: Openings in walls and ceilings.

D. Section 09 91 00 – Painting: Field paint finish.

E. Section 22 00 50 – Basic Plumbing Materials and Methods.

1.3 REFERENCES

A. NFPA 80 (National Fire Protection Association) – Fire Doors and Fire Windows.

B. UL (Underwriters Laboratories, Inc.) – Building Materials Directory.

C. ITS (Intertek Testing Services) – Directory of Listed Products.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations and details of adjoining work.

1.5 FIELD MEASUREMENTS

A. Verify that field measurements are as instructed by the manufacturer.

1.6 COORDINATION

A. Coordinate the work with framing work and detention hardware requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design: Nystrom. Products:

1. Model UT at fire-rated masonry wall assemblies.
   a. Size: 32 inches x 32 inches, unless otherwise indicated on Drawings.
   b. Certification: UL listed “B” label for 1-1/2 hour rating.
   c. Gasket installed.

d. Uninsulated.

e. Provide masonry anchors.

2. Model NW-S (Stainless Steel) at non-secure toilet, and shower areas.

a. Size: 24 inches x 24 inches, unless otherwise indicated on Drawings.

3. Model MT Medium Security access door; size 24 inches by 24 inches, at all other wall and ceiling areas.

4. Model RGB-R with recess for 5/8 inch gypsum board at lobby/seating and waiting areas only.

a. Size: 24 inches x 24 inches, unless otherwise indicated on Drawings.

B. Milcor.

C. J.L. Industries.

D. Karp.

E. Substitutions: Under provisions of Division 01.

2.2 FABRICATION

A. Doors:

1. UT Series: 14 gauge cold rolled steel.
2. NW-S Series: 14 gauge minimum stainless steel.
3. MT Medium Security Series: 12 gauge cold rolled steel.
4. RGB-R Series: Welded aluminum, removable.

B. Frames:

1. UT Series: 16 gauge cold rolled steel.
2. NW-S Series: 16 gauge minimum stainless steel.
3. MT Medium Security Series: 12 gauge cold rolled steel with 1 inch flange.
4. RGB-R Series: Welded aluminum.

C. Hinges:

1. UT Series: Concealed pin hinge.
2. NW-S Series: Concealed spring pin hinge.
3. MT Medium Security Series: Concealed continuous piano hinge.
4. RGB-R Series: Open pin hinge.

D. Latches:

1. UT Series: Keyed slam latch. Fire-rated doors shall be self-closing and self-latching.

a. Provide interior release mechanism.

b. Latch bolt cover shall extend 1/2 inch beyond outside edge of frame.

2. NW-S Series: Pin allen head security cam latch.
3. MT Medium Security Series: Key operated cylinder lock.
4. RGB-R Series: Key operated cylinder lock; two latches per door.

E. Factory Finishes:
   1. UT Series: White powder coat paint finish.
   2. MT Series: Phosphate dipped and prime coated.
   3. NW-S Series: #304 stainless steel.
   4. RGB-R Series: Mill finish aluminum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that rough openings for door and frame are correctly sized and located.

3.2 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in opening.

C. Secure access doors and panels rigidly in place. Anchor to structure with anchors appropriate for use with type of adjacent construction. Fasteners shall securely fasten items to wall/ceiling construction involved. Fasteners shall provide stiffness and rigidity to keep items square, in accurate position without twisting, buckling or warping. Fasteners to framing substrate shall be the following minimums; greater as required by the access door/panel manufacturer or as conditions warrant:
   1. Metal Framing: Three No.10 self-tapping sheet metal screws each side of panel by length as required to penetrate framing member 1/4 inch minimum.
   2. Masonry: Tee anchors.

D. Position unit to provide convenient access to concealed work requiring access.

E. Unless noted otherwise, all access doors and panels shall be field painted under provisions of Section 09 91 00.
   1. Do not paint stainless steel access doors and panels.

END OF SECTION

SECTION 08 33 13

COILING COUNTER DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coiling counter doors; operating hardware; manual operation.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 08 33 23 – Overhead Coiling Doors.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM A666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details. Method of anchorage to be acceptable to Architect.

1. Verify locking requirements with Owner.

C. Product Data: Provide general construction, component connections, and details.

D. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.

1.5 SYSTEM DESCRIPTION

A. Manual push-up operated unit with overhead counter balance device.

B. Between jamb mounted.

1.6 MAINTENANCE DATA

A. Submit under provisions of Division 01.

B. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in labeled protective packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.

1.8 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Acceptable Manufacturers:
   1. Overhead Door Corp. Product: Model 657.
   2. CornellCookson, Inc.

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Curtain: Conforming to the following:
   1. Slats: Interlocking, 22 gauge stainless steel.
   2. Nominal Slat Size: 1-1/4 inches wide x 1/2 inch deep x required length.
   3. Curtain Bottom: Fitted with stainless steel bottom bar to provide reinforcement and positive contact with counter in closed position.
   4. Provide endlocks for curtain alignment.

B. Integral Frame, Hood and Fascia: 16 gauge stainless steel with No. 4 finish. Internally reinforce hood to maintain rigidity and shape.

C. Sill (counter): 14 gauge stainless steel with No. 4 finish.

D. Brackets: 11 gauge steel.

E. Roller Shaft Counterbalance: Steel pipe and helical torsion steel spring system, capable of producing torque sufficient to assure smooth operation of curtain from any position; with adjustable spring tension wheel. Counterbalance shall be housed in a steel tube or pipe barrel, supporting the curtain with a maximum deflection of 0.03 inch per foot of span.

F. Hardware: Door shall be furnished with bottom bar lift handles, vinyl astragal, and slide bolts which extend into slots in the guides for locking.

G. Finish: All stainless steel components shall have a No. 4 finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.2 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

3.3 ERECTION TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation from Plumb: 1/16 inch.

C. Maximum Variation from Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 foot straight edge.

3.4 ADJUSTING

A. Adjust work under provisions of Division 01.

B. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.

C. Adjust door, hardware and operating assemblies for smooth and noiseless operation.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain coiling counter doors.

3.6 CLEANING

A. Clean work under provisions of Division 01.

B. Clean door and components.

C. Remove labels and visible markings.

D. Touch-up, repair or replace damaged products.

END OF SECTION

SECTION 08 33 23

OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Insulated overhead coiling service doors, non-rated, operating hardware, motor operation.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 09 91 00 – Painting.

C. Division 26 – Electrical: Motor and Controls Connections.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM A924 – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
3. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).
4. NEMA ICS 2 – Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated 600 Volts.
5. NEMA MG1 – Motors and Generators.
6. UL Building Materials Directory.
7. UL 325 – Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, electrical connections and controls, and installation details. Method of attachment to structure shall be acceptable to Architect.

C. Product Data: Provide general construction, component connections and details.

D. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.

1.5 SYSTEM DESCRIPTION

A. Motor operated unit with overhead counter balance device.

B. Wind Loads: Exterior doors shall withstand [twenty] pounds per square foot design wind load.

C. Face-of-wall surface mounted.

1.6 MAINTENANCE DATA

A. Submit under provisions of Division 01.

B. Maintenance Data: Indicate lubrication requirements and frequency, and periodic adjustments required.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in labeled protective packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.

1.8 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Overhead Door Corp., Products:
      a. EverServe 625S Series.
      b. Operator: RSX Series.
   2. CornellCookson, Inc.

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Curtain:
   1. Slats: Interlocking, flat profile, 18 gauge ASTM A653 galvanized steel front cover and 24 gauge galvanized steel back cover.
   2. Nominal Slat Size: Insulated: 2-5/8 inches wide x required length x 3/4 inch deep, filled with 2.2 pound density CFC-free foamed-in-place polyurethane foam having an R-Value of 7.7 and an STC Rating of 21.
      a. Air Infiltration: Meets ASHRAE 90.1 and IECC 2012/2015 C402.4.3 air leakage of less than 1.00 cubic feet per minute per square foot.
   3. Curtain Bottom: Two – 3/16 inch thick galvanized steel angles bolted back-to-back with weather-stripping to provide curtain reinforcement and positive contact with floor when in closed position. Provide electric sensing edge.

4. End locks shall be installed on alternate slats. Windlocks shall be provided on exterior doors as required to meet [twenty] pounds per square foot design wind load.

B. Guides: Three – 3/16 inch thick galvanized structural steel angles, continuous, with high usage vinyl weather seal at each jamb, on the exterior curtain side.

C. Door Roll: Directly driven, springless roll shall be steel tube with integral shafts, keyed on the drive end and supported by self-aligning greaseable sealed bearings. Door shall not require any counterbalance device.

D. Hood Enclosure: 24 gauge galvanized steel, internally reinforced to maintain rigidity and shape, weather-stripped. Provide internal hood baffle weatherseal.

E. Brackets: Galvanized steel to support counterbalance, curtain, and hood.

F. Weatherseals:
1. Vinyl bottom seal.
2. Exterior guide seals.
3. Internal hood seals.
4. Interior guide weatherseal.
5. Lintel weatherseal.

2.3 MOTOR OPERATION

A. Standards: Motor operator unit approved and listed by UL Electrical equipment conforming to NEMA Standards.

B. Motor Operator Unit: Wall or bracket mounted in compact unit enclosed by metal housing, capable of moving curtain up or down at rate of not less than 2/3 foot per second nor more than one foot per second, consisting of motor connected to speed reducer, solenoid activated clutch brake, limit switch and emergency stop bar together with such controls as specified or required. Provide built-in brake mechanism eliminates uncontrolled curtain travel independent of other safeties.

C. Current Characteristics for Motor and Controls: To suit that available at door locations as shown on Electrical Drawings.

D. Motor: One horsepower, 208V, 60 Hz, single-phase, heavy duty, high starting torque, Class A insulated, hoist duty motor. Horsepower rating shall have large overload factor.

E. Drive: Either direct motor connected or noiseless roller chain drive to speed reducing worm gear assembly submerged in oil bath. Sprocket and gears, steel with machine cut teeth, or high-strength gray cast iron with either machine cut teeth or machine molded from machine cut patterns. Bearings self-aligning precision ball bearings or permanently lubricated type.

F. Starter: Magnetic, across-the-line starter with thermal overload, under-voltage protection and magnetic reversing contractor, key-operated switch with three positions marked "UP," "DOWN," and "STOP" or "OPEN," "CLOSE" and "OFF." Surface wall-mounted on interior of building with stainless steel faceplate.

G. Limit Switch: Provide as needed to limit travel of curtain up and down. Timing shall not be affected when operation changes from motor to manual or when motor is removed.

H. Safety Switch: Provide interlocking safety switch to shut off current to motor when curtain is being manually operated. Provide emergency stop edge at bottom bar extending across full width of door to automatically stop or reverse downward travel of curtain when contact is made with obstruction in opening.

I. Emergency Operation: Provide endless galvanized chain within reach of floor and not more than 12 inches from wall, for manual operation in emergency. Manual operation shall be possible when motor is disconnected, or under any conditions that make power unit inoperable.

J. Control Panel: Electronic controller with microprocessor self-diagnostics. Digital readout shall indicate door action, alarm conditions, and fault conditions. Provide time delay self-close timer and non-resettable cycle counter. Enclosure shall be IP54 rated (NEMA 3 equivalent).

2.4 FINISHES

A. Galvanized Steel: Slats, guides, and hood shall be galvanized in accordance with ASTM A653, and shall receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat.

1. Non-galvanized exposed ferrous surfaces shall receive one coat of rust-inhibitive primer.
2. Top Coat Color: Powder coat finish in color as selected by Architect from manufacturer's standard colors.
3. Field paint finish under provisions of Section 09 91 00. Color as selected by Architect.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.2 INSTALLATION

A. Install coiling door unit assembly in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware level and plumb, to provide smooth operation.

E. Install hood.

F. Connect motor and key switch station to electrical service.

3.3 ERECTION TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation from Plumb: 1/16 inch.

C. Maximum Variation from Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch in 10 feet.

3.4 ADJUSTING

A. Adjust work under provisions of Division 01.

B. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.

C. Adjust hardware and operating assemblies for smooth and noiseless operation.

D. Lubricate bearings and sliding parts as recommended by manufacturer.

E. Adjust seals to provide weathertight fit around entire perimeter.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

3.6 CLEANING

A. Clean work under provisions of Division 01.

B. Clean door and components.

C. Remove labels and visible markings.

D. Touch-up, repair or replace damaged products.

END OF SECTION

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum storefront system, thermally broken.

B. Aluminum and glass doors.

C. Vision glass.

D. Perimeter sealant.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 05 40 00 – Cold-Formed Metal Framing.

C. Section 07 25 00 – Weather Barriers.

D. Section 07 92 00 – Joint Sealants.

E. Section 08 71 00 – Door Hardware.

F. Section 08 81 00 – Glass Glazing.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. AA – Designation System for Aluminum Finishes.
2. AAMA SFM-1 – Aluminum Store Front and Entrance Manual.
3. AAMA 611 – Voluntary Standards for Anodized Architectural Aluminum.
4. ASTM A36/A36M – Standard Specification for Carbon Structural Steel.
5. ASTM B209/B209M – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
6. ASTM B221/B221M – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
7. ASTM E283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

8. ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform Static Air Pressure Difference.
9. NFRC 100 – Procedure for Determining Fenestration Product U-Factors.
10. NFRC 200 – Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
11. NFRC 400 – Procedure for Determining Fenestration Product Air Leakage.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and anchor type, size, and spacing.

C. Product Data: Provide component dimensions, describe components within assembly, including anchorage, fasteners, and glass.

D. Submit two samples, 12 inches by 12 inches minimum in size, illustrating pre-finished aluminum surface, EPDM or neoprene gasketing, glass and glazing materials, and flexible flashing membrane.

E. Provide windload and deadload charts to verify that the system meets all design loads and meets the minimum pounds per square foot required at the location of the project.

1.5 SYSTEM DESCRIPTION

A. Aluminum storefront system includes shop fabricated, factory pre-finished tubular aluminum sections and doors, glass, related flashings, anchorage, and attachment devices.

1.6 PERFORMANCE REQUIREMENTS

A. Air leakage of window system shall not exceed 0.06 cubic feet per minute per square foot of window area at a pressure differential of 6.2 pounds per square foot when tested according to NFRC 400 or ASTM E283.

B. Water resistance of window system shall show no leakage at a minimum static air pressure differential of 8.0 pounds per square foot when tested according to ASTM E331.

C. Air leakage of each single entrance door shall not exceed 0.3 cubic feet per minute per square foot of door area at a pressure differential of 1.57 pounds per square foot when tested according to NFRC 400 or ASTM E283.

1.7 REGULATORY REQUIREMENTS

A. Window systems and exterior doors shall be certified under provisions of the 2022 California Energy Code (CEC), Section 110.6.

1. A fenestration product's U-factor shall be rated in accordance with NFRC 100, using the specific glazing, window system, and door assemblies to be installed on the project.

a. If there is less than 10,000 square feet of site-built fenestration on the project, the default U-factor may be calculated as set forth in Reference Nonresidential Appendix NA6.

2. A fenestration product's Solar Heat Gain Coefficient (SHGC) shall be rated in accordance with NFRC 200, using the specific glazing, window system, and door assemblies to be installed on the project.
    a. If there is less than 10,000 square feet of site-built fenestration on the project, the default SHGC may be calculated as set forth in Reference Nonresidential Appendix NA6.
3. Provide label certificate for each type of window and door product indicating compliance of the assembly with the U-factors listed in Table 110.6-A, SHGC values listed in Table 110.6-B, and air leakage requirements specified in this Section. Field-fabricated fenestration and exterior doors may only be installed when documentation indicating compliance with the above has been provided.
4. A Certificate of Acceptance certifying that the fenestration product meets the acceptance requirements of 2022 CEC Section 110.6 shall be completed, signed, and submitted to the enforcement agency.

1.8 QUALITY ASSURANCE

A. Perform Work in accordance with AAMA SFM-1.

B. These requirements establish standards of design and quality for material, construction and workmanship. When substitute products of equal quality are to be submitted, Contractor shall submit for consideration supporting technical literature, samples, drawings and performance data so these items may be evaluated.

C. The approved manufacturer's recommended installation procedures will become the basis for inspecting or rejecting actual installation procedures used on the work.

D. Single Source Responsibility: Provide storefront system, doors, and accessories produced as standard products of one single manufacturer.

1.9 QUALIFICATIONS

A. Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 01.

B. Protect pre-finished aluminum surfaces with strippable coating. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.11 WARRANTIES

A. Storefront System and Doors:
    1. Provide written warranty in form acceptable to Owner jointly signed by manufacturer, installer and Contractor warranting work to be watertight, free from defective materials, defective workmanship, glass breakage due to defective design, and agreeing to replace components which fail within one year from date of Project Completion.
    2. Warranty shall cover following:
        a. Complete watertight and airtight system installation within specified tolerances.
        b. System is structurally sound and free from distortion.

B. Finish:

1. Finished coating system specified in this Section, as applied over aluminum extrusions, shall be warrantied for a period of ten years from date of Project Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Kawneer North America, Norcross, GA; 770-449-5555, www.kawneer.com. Product: Trifab VG 451T storefront, center set, with Series 350 Medium Stile doors.
2. Oldcastle Building Envelope, Santa Monica, CA; 866-653-2278, www.oldcastlebe.com.
3. Arcadia Incorporated, Vernon, CA; 323-269-7300, www.arcadiainc.com.
4. EFCO Corporation, Monett, MO; 800-221-4169. www.efcocorp.com.

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Extruded Aluminum: ASTM B221; 6063 alloy, T6 temper. Wall thickness shall provide structural strength to meet specified performance requirements.

B. Sheet Aluminum: ASTM B209.

C. Fasteners: Stainless steel.

D. Perimeter Anchors: Stainless steel.

1. Acceptable structural attachment locations are indicated on the Structural Drawings. For aesthetic purposes, also coordinate locations and appearance of connections exposed to view with Architect.
2. Manufacturer shall be responsible for sizing, providing and installing all clips and associated fasteners. Clips and fasteners shall not be fabricated or installed until the Shop Drawings have received final acceptance from Architect.

2.3 DOORS

A. Doors: Corner construction shall consist of mechanical clip fastening, SIGMA deep penetration and minimum 1-1/8 inch long fillet welds. Glazing stops shall be snap-in type with EPDM flashing gaskets. Refer to Drawings for stile and rail sizes.

1. Hardware: As specified in Section 08 71 00. Hardware shall be installed at the factory prior to shipment.
2. Thresholds: Thresholds shall be one piece thresholds in a bed of mastic. Threshold shall set no higher than 1/2 inch from the lowest floor surface. When complete, threshold shall be accessible.

B. Weather-strip: Door manufacturer's standard felt insert strip designed into door system along perimeter door edges.

2.4 ACCESSORIES

A. Flashings and Closures: 0.050 inch thick aluminum, finish to match window wall system finish where exposed.

2.5 GLASS AND GLAZING MATERIALS

A. Glass and Glazing Materials:

1. Storefront System and Doors: 1 inch insulated glass units as specified in Section 08 81 00.

B. Glazing gaskets and seals used for aluminum work shall be an integrated glazing system designed by the aluminum work manufacturer to produce a watertight assembly, and shall be physically and chemically compatible with each other and with adjacent materials.

1. Neoprene and EPDM materials shall not come in contact with silicone sealant materials.
2. Gaskets shall be designed, when in final compression form, to be compressed a minimum of 25 percent and a maximum of 40 percent, and to exert a pressure of between four pounds and ten pounds pressure per linear inch.
3. All side light and transom glass shall be set with the same type and size of glazing gasket material.

C. Contractor shall provide and set silicone setting blocks for all window systems installed. Each glass panel supplied shall display a factory mark certifying each glass panel is manufactured of tempered glass. Plate glass and laminated glass will not be acceptable.

1. All setting blocks shall be silicone, of 80 - 90 durometer, and be set at 1/4 points of glass.

2.6 FLEXIBLE FLASHING MATERIALS

A. Flexible Flashing Materials: As specified in Section 07 25 00.

2.7 SEALANT MATERIALS

A. Sealant and Backing Materials: As specified in Section 07 92 00.

2.8 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof. Sealant will not be allowed at exposed joints.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Arrange fasteners and attachments to conceal from view.

E. Prepare components with internal reinforcement of 1/4 inch thick galvanized steel mounting backing plates for door hardware and hinge hardware as per ASTM A36.

F. Exposed work shall be carefully matched to produce continuity of line, design and finish. Joints in exposed work, unless otherwise shown or required for thermal movement, shall be accurately fitted, rigidly secured with hairline contacts and sealed watertight.

G. Removable members such as glass stops shall be extruded and securely engaged into adjacent components as indicated by product manufacturer.

H. Face clearances between glass and stop shall comply with code requirements and glass manufacturer's recommendations.

I. All fasteners shall be of sufficient strength to support both horizontal wind load and vertical dead load, with a Factor of Safety of 1.5. They shall be spaced and be sized to develop the maximum strength of the members they secure or support. Washers, where required, shall be of the same material as the fastener. Unless otherwise shown or approved, fastening systems shall be concealed.

J. Install internal steel stiffeners within the window wall system as required to meet the windload/deflection requirements at the location of this project.

K. Sealants, gaskets, setting blacks, tapes and separators, where used, shall be physically and chemically compatible with each other and with adjacent materials. Items shall be installed so that they will not become dislodged during or after assembly of units.

2.9 SPECIAL REQUIREMENTS

A. Dissimilar Materials Protection: Use chromate gasketing to separate aluminum surfaces in contact with other metals, plaster or concrete, or heavy coat of alkali resistant bituminous paint. Aluminum need not be separated from stainless steel or galvanized steel.

2.10 FINISH

A. All aluminum extrusions shall have Architectural Class I finish per Aluminum Association Standard AA-M10 C21 A41, clear anodized complying with AAMA 611, 0.7 mil minimum thickness.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify dimensions, tolerances and method of attachment with other work.

B. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

3.2 INSTALLATION

A. Install window wall system and doors in accordance with accepted shop drawings, manufacturer's instructions and AAMA SFM-1. Manufacturer shall provide installation instructions and installer shall comply with these instructions.

B. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

C. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

D. Provide alignment attachments and shims to permanently fasten system to building structure.

E. Frames shall be anchored to structure with concealed fasteners appropriate for use with type of adjacent construction. Fasteners shall securely fasten frames to wall construction involved. Fasteners shall provide stiffness and rigidity to keep frames square, in accurate position without twisting, buckling or warping. Fasteners to framing substrate shall be the following minimums; greater as required by the window wall manufacturer or as conditions warrant:

1. Metal Framing: #14 stainless steel self-tapping sheet metal screws at 12 inches on center all around by length as required to penetrate framing member 1/4 inch minimum.
2. Masonry: 1/4 inch diameter stainless steel wedge anchors at 24 inches on center with 1-1/2 inch minimum embedment into substrate and 2 inches minimum edge distance to face of substrate.

F. Install perimeter flexible flashing membrane around all window openings in accordance with manufacturers' installation instructions and under provisions of Section 07 25 00.

G. Install perimeter metal flashings.

H. Install perimeter sealant to method required to achieve performance criteria and installation criteria described in Section 07 92 00.

I. Set thresholds in bed of mastic and secure with mechanical fasteners, minimum three per threshold.

J. Refer to Section 08 71 00 for door hardware installation requirements.

K. Install glass in accordance with Section 08 81 00, to glazing method required to achieve performance criteria.

3.3 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch every 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 CLEARANCES

A. Top and sides of door shall have a minimum of 1/16 inch to a maximum of 1/8 inch clearance.

B. Bottom of door and threshold shall have a minimum of 1/8 inch to a maximum of 1/4 inch clearance.

C. All doorframes shall be measured with the minimum clearance of exact size or a maximum of 1/4 inch overall clearance to fit sides of opening to 1/8 inch at top of opening.

D. All installation clearances for door frame and door shall be strictly adhered to. No other minimum or maximum clearances will be acceptable and will prove cause for total replacement of the opening at the sole expense to Contractor.

E. Mortise hardware shall fit flush with finished trim moldings and applied directly to recessed sidewalls of the door and or frame system. Cutouts in door or frame moldings shall require separate screw applied tabs or straps on which to mount concealed hardware per manufacturer's templates as detailed on Drawings. Where shims and spaces are required for finished appearance, they shall provide full and solid bearing for the hardware.

3.5 ADJUSTING

A. Adjust work under provisions of Division 01.

B. Adjust operating hardware for smooth operation.

3.6 CLEANING

A. Clean work under provisions of Division 01.

B. Remove protective material from pre-finished aluminum surfaces.

C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

D. Remove excess sealant by method acceptable to sealant manufacturer.

3.7 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Division 01.

B. Protect finished Work from damage.

END OF SECTION

SECTION 08 56 19

TRANSACTION WINDOWS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Stainless steel exchange windows with fixed glazing, deal drawers, shelves, and speak-throughs.

B. Perimeter sealant.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 05 50 00 – Metal Fabrications: Stainless steel countertop.

C. Section 07 92 00 – Joint Sealants: Perimeter sealant and back-up materials.

D. Section 11 98 15 – Detention Security Glazing.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. AAMA 605.2 – Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
2. ASTM A666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
3. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work and installation requirements.

C. Product Data: Provide component dimensions, anchorage, fasteners and glass.

D. Submit two samples 6 inch by 6 inch size illustrating window frame section, mullion section, pre-finished aluminum surfaces and glazing materials.

E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.5 REGULATORY REQUIREMENTS

A. Transaction windows shall comply with the reach and access requirements of CBC Sections 11B-227.3, 11B-305, 11B-306, 11B-308, and 11B-904.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with AAMA 101.

1.7 QUALIFICATIONS

A. Manufacturer and Installer: Company specializing in manufacturing institutional aluminum exchange windows with sufficient documented experience.

1.8 PRE-INSTALLATION CONFERENCE

A. Convene one week prior to commencing work of this Section, under provisions of Division 01.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 01.

B. Protect finished surfaces with strippable coating. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.10 JOB AND ENVIRONMENTAL CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and after installation of sealants.

1.11 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. C.R. Laurence Co., Products:
      a. Standard Inset Aluminum Frame, Series S1EW, with 18 inch deep stainless steel shelf, Level 3 deal tray, Model No. CLD103 speaking device, and bullet resistant glazing. Center shelf depth in frame.
      b. Standard Inset Aluminum Frame, Series S1VE, 4-7/8 inch deep bullet resistant exchange window with Level 1 Series SSS 18 inch deep stainless steel shelf with shelf brackets, and bullet resistant glazing. Center shelf depth in frame.
   2. Chicago Bullet Proof Systems.

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Extruded Aluminum: ASTM B221; 6063 Alloy, T5 Temper.

B. Stainless Steel. ASTM A666; Type 304.

C. Fasteners: Stainless steel screws.

2.3 GLASS AND GLAZING MATERIALS

A. Glass and Glazing Materials: Level 2 protection, 1-7/8 inch thickness, clear, factory installed. Refer to Section 11 98 15, Detention Security Glazing.

2.4 SEALANT MATERIALS

A. Sealant and Backing Materials: As specified in Section 07 92 00.

2.5 SCHEDULE OF ITEMS

A. At Lobby Window and Booking:

1. Standard Inset Aluminum Frame, Series S1EW, with 18 inch deep stainless steel shelf, Level 3 deal tray, Model No. CLD103 speaking device, and bullet resistant glazing. Center shelf depth in frame.

B. Non-Contact Visit Rooms:

1. Standard Inset Aluminum Frame, Series S1VE, 4-7/8 inch deep bullet resistant exchange window with Level 1 Series SSS 18 inch deep stainless steel shelf, and bullet resistant glazing. Center shelf depth in frame.

2.6 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Arrange fasteners and attachments to ensure concealment from view.

2.7 FINISHES

A. Aluminum: Standard factory satin anodized aluminum.

B. Stainless Steel: Brushed stainless steel with No. 4 finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site opening conditions under provisions of Division 01.

B. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

3.2 INSTALLATION

A. Install exchange window frames, deal drawers, shelving, and glazing in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align shelf drawer and window plumb and level, free of warp or twist. Maintain dimensional tolerances, aligning with adjacent work.

D. Install sill and sill end angles.

E. Install shelf and speak-through.

F. Install glazing in accordance with Section 11 98 15, to glazing method required to achieve performance criteria.

G. Install perimeter sealant to method required to achieve installation criteria in accordance with Section 07 92 00.

3.3 TOLERANCES

A. Maximum Variation from Level or Plumb: 0.06 inch every 3 feet, non-cumulative.

3.4 CLEANING

A. Clean work under provisions of Division 01.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by moderate use of methods and products acceptable to sealant manufacturer.

END OF SECTION

SECTION 08 62 00

UNIT SKYLIGHTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fixed metal-framed unit skylights.

B. Integral counter-flashings.

C. Insulated curb with integral safety grid.

1.2 RELATED SECTIONS

A. Section 05 12 00 – Structural Steel Framing: Support Framing.

B. Section 05 31 00 – Steel Decking.

C. Section 07 54 23 – Thermoplastic-Polyolefin Roofing.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. AAMA/WDMA/CSA 101/I.S.2/A440 – North American Fenestration Standard Specification for Windows, Doors, and Skylights.
2. ASTM E283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
3. ASTM D1925 - Test Method for Yellowness Index
4. California Code of Regulations, Title 8, Division 1, Chapter 4, Sub-Chapter 7 – General Industrial Safety Orders.
5. NFRC 100 – Procedure for Determining Fenestration Product U-Factors.
6. NFRC 200 – Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
7. NFRC 400 – Procedure for Determining Fenestration Product Air Leakage.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Provide configurations, dimensions, locations, methods of construction, location and spacing of anchorage, joinery, finishes, size, shape, thickness and alloy of framing materials, glazing materials and installation details. Submit structural calculations from a Structural Engineer licensed in the State of California demonstrating compliance with the structural requirements specified.

C. Include characteristics of light admitted, transparency and insulation value of unit.

D. Submit manufacturer's installation instructions under provisions of Division 01.

1.5 PERFORMANCE REQUIREMENTS

A. Per CBC Section 2405.5, tubular skylights shall be tested and labeled as complying with AAMA/WDMA/CSA 101/I.S.2/A440. The label shall state the name of the manufacturer, the approved labeling agency, the product designation, and the performance grade rating as specified in AAMA/WDMA/CSA 101/I.S.2/A440.

B. Light-transmitting plastic skylight glazing shall comply with CBC Section 2610.

C. Air leakage of skylight shall not exceed 0.3 cubic feet per minute per square foot of glazing area at a pressure differential of 1.57 pounds per square foot when tested according to NFRC-400 or ASTM E283.

D. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 degrees F without causing detrimental effects to system or components.

E. Design and size members to withstand wind loads, dead loads, and live loads caused by snow, hail, and pressure or suction of wind acting vertically as calculated in accordance with CBC.

1.6 REGULATORY REQUIREMENTS

A. Skylights shall be certified under provisions of the 2022 California Energy Code, Section 110.6.

1. A skylight’s U-factor shall be rated in accordance with NFRC 100, using the specific glazing and frame assemblies to be installed on the Project.
2. A skylight’s Solar Heat Gain Coefficient (SHGC) shall be rated in accordance with NFRC 200, using the specific glazing and frame assemblies to be installed on the Project.
3. Provide factory-applied temporary labels, not to be removed before inspection by the enforcement agency, listing the certified U-factor and SHGC, and certifying that the air leakage requirements specified in this Section are met for each type of skylight, and have a factory-applied permanent label if the product is rated using NFRC procedures. Fenestration products may only be installed when documentation indicating compliance with the above has been provided.
4. A Certificate of Acceptance shall be submitted to the enforcement agency that certifies that the skylight product meets the acceptance requirements.

B. Skylights shall conform to requirements of California Code of Regulations, Title 8, General Industrial Safety Orders, Article 3212.

1.7 DELIVERY STORAGE AND HANDLING

A. Deliver skylight system, components and materials in manufacturer's standard protective packaging.

B. Store skylight panels on the long edge, several inches above the ground, blocked and under cover to prevent warping. In accordance with manufacturer’s storage and handling instructions.

1.8 WARRANTY

A. Properly installed skylight shall be leak-free for a period of ten years.

B. Dome Yellowing:

1. No yellowing shall occur during the first five years that exceeds a yellowness index value of 5.0.
2. During the next five years, no yellowing shall occur that exceeds a yellowness index value of 10.0.
3. Yellowness index shall be measured with a certified colorimeter.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Sunoptics Prismatic Skylights. Products:

1. Skylight Unit: Frame Model 800MD, curb mounted.
   a. ICC-ES Evaluation Report Number ESR-3557.
   b. ATI Evaluation Service Code Compliance Research Report Number CCRR-0113.
   c. AAMA Certified Products Report Number 95749.01-301-44.
   d. NFRC Simulation Report Number A2457.01-301-45.
2. Insulated curb with integral safety grid: Model ARC-3.

B. Kingspan Light & Air LLC.

C. O'Keeffe's Skylights.

D. Lane-Aire Manufacturing Corporation.

E. Substitutions: Under provisions of Division 01.

2.2 SKYLIGHT

A. Nominal Size: 4 feet – 0 inches x 4 feet – 0 inches.

B. Dome Shape: Pyramid.

C. Glazing: Double glazed using 0.230 inch thick 50 CC2 50 percent Impact Modified acrylic clear prismatic outer lens over 0.120 inch thick 50 CC2 50 percent Impact Modified acrylic white inner lens, air sealed.

1. Solar Heat Gain Coefficient: 0.42.
2. U Value: 0.70.
3. Visible Light Transmission: 0.68.

D. Frame: Skylight frames shall be fabricated from 6063-T5 aluminum, finish as selected by Architect. Frames shall have integral condensation and weepage gutters which drain interior moisture to the outside. Corners shall be mitered and welded. Skylight frames shall be insulated and thermally broken. The acrylic glazing shall be separated from the skylight frame with an EPDM rubber air seal gasket.

2.3 ACCESSORIES

A. Anchorage Devices: Type recommended by manufacturer.

B. Counter-flashings: Same metal type and finish as roof flashing metal.

C. Protective Back Coating: Bituminous.

D. Sealant: As specified in Section 07 92 00.

2.4 INSULATED CURB

A. Premanufactured insulated curb shall be fabricated from galvanized steel with rigid insulation, integral safety grid, and wood nailer for attachment of skylight frame; all welded construction.

1. Exterior Wall: 18 gauge galvanized steel, mill finish.
2. Interior Wall: 20 gauge galvanized steel, white paint finish.
3. Insulation: 1-1/2 inch, 3 pound density fiberglass insulation. Insulation shall be full height and continuous around exterior perimeter of curb with no voids or gaps.
4. Safety/Security Grid: 4 inch x 4 inch x 1/4 inch galvanized steel angle frame with 1/2 inch diameter cold-rolled galvanized steel bars with 75,000 PSI tensile strength, welded at 6 inches on center each direction. Grid shall be attached to curb framing with mechanical fasteners.
5. Wood Nailers: 2 x 2 pressure treated nailer continuous around and fastened to curb top.
6. Top of curb shall be level. Fabricate bottom of curb to match roof slope.

2.5 FABRICATION

A. Fabricate in accordance with manufacturer recommendations free of visual distortion and defects.

B. Provide for removal of condensation.

C. Provide weathertight assembly.

D. Fabricate to drain water entering joints, or migrating moisture occurring within unit, to exterior.

E. Factory-fabricate and preassemble in largest size assembly consistent with economic considerations for shipping to and handling at the job site.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install skylights, curb, and safety grid in accordance with manufacturer's instructions.

B. Installation of the plastic skylights in fire retardant roofs shall not be started until the units proposed have been approved by the State Fire Marshal.

1. Review shall be based on test data from an acceptable testing laboratory or evidence of listing with the State Fire Marshal.

C. Coordinate with installation of roofing system, curbs, and related flashings.

D. Apply bituminous paint on aluminum surfaces of units in contact with cementitious materials or dissimilar metals.

E. Provide weathertight installation.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. BHMA finish door hardware for gates and hollow metal, wood, and aluminum doors.

B. Accessories including but not limited to door stops, kickplates, and push/pull plates.

C. Weatherstripping, seals, and thresholds.

1.2 PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS SECTION

A. Hardware templates for gates, doors, and frames.

1.3 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 07 92 00 – Joint Sealants.

C. Section 08 11 13 – Hollow Metal Doors and Frames.

D. Section 08 14 00 – Wood Doors.

E. Section 08 41 13 – Aluminum Framed Entrances and Storefronts.

F. Section 08 71 13 – Automatic Door Operators.

G. Section 09 22 16 – Non-Structural Metal Framing.

H. Divisions 26 through 28: Electrical rough in, wiring and connectors for electrified hardware including, but not limited to:

1. Wire and connectivity from ceiling through frame to electrified hardware devices including non-Section 08 71 00 task of providing wiring inside of doors.
2. Section 08 71 13 “Automatic Door Operators”.

I. Section 32 31 13.53 – High Security Chain Link Fences and Gates.

1.4 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only.

1. Refer to Division 01 for definitions, acronyms, and abbreviations.
2. Unless otherwise noted; standards, manuals, and codes refer to the latest edition as of the issue date of this Project Manual.

B. Conform to the following Referenced Standards and Requirements:

1. CBC – 2022 California Building Code.
2. ADA – Americans with Disabilities Act - 2010 Standards for Accessible Design.

3. NFPA 80-16 – Standard for Fire Doors and other Opening Protectives.
4. NFPA 101-18 – Life Safety Code.
5. ANSI/BHMA 156.19 American National Standard for power high and low energy operated doors.
6. ANSI A156 Series – Builders Hardware Manufacturers Association (BHMA) Standards Set.
7. AAADM – American Association of Automatic Door Manufacturers.

1.5 QUALITY ASSURANCE

A. Supplier Qualifications and Documentation:
   1. Hardware Supplier Qualifications: Firm specializing in the supply and servicing of institutional and commercial door hardware; accredited by manufacturers; and having a minimum of three years documented experience. Hardware supplier to furnish list of at least ten past, finished projects. Include date competed, project location, and references. At least one member of the firm's staff shall be a member of DHI in good standing and is a DHI certified consultant having earned the title Architectural Hardware Consultant (AHC).

B. Manufacturer of Submitted Devices - Qualifications and Documentation:
   1. Manufacturer Qualifications: Manufacturer specializing in manufacturing institutional and commercial door hardware with a minimum five years with the following documented experience. Furnish list of at least ten past, finished projects. Include date competed, project location, and references. Past project contact information will determine if Builders Hardware is acceptable.

C. Installer of Submitted Devices - Qualifications and Documentation:
   1. Installer of assembly shall be trained in the trade of hanging commercial doors on commercial frames with commercial hardware. Supplier and Installer of door assemblies shall be authorized representative of manufacturers and have minimum of five years successful experience in detailing, supplying, and installing door assemblies specified on projects of similar size, complexity, and type to this Project. Provide written documentation to show closers will be installed by an individual with successful experience installing closers to meet 5-pound opening force for non-rated door complexity.

1.6 SUBMITTALS

A. The hardware groups/sets specified in Section 08 71 00 - Part 3 are intended to establish type and design standard when used together with the requirements of this Section, Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections. Examine Contract Documents and furnish proper hardware for door openings. Refer to specifications for clarification and detailed requirements and provide products and services in specifications even if not written in hardware groups/sets in Section 08 71 00 - Part 3.

B. For each opening submit coordinated (means and methods) requirements in accordance with Division 01 and a detailed door, frame and hardware schedule. See pre-hardware and hardware scheduling requirements below. Submittals that do not meet means and methods, including missing related doors/frames submittal/shop drawings, will be returned for correction before checking.

C. Pre-Hardware Scheduling Tasks:

1. Coordinate work of this Section with other directly affected Sections and scope.
2. Provide required Division 08, means and method type work in accordance with Contract Documents at no additional cost to project, including Division 01 and language below. This Section supplier shall be provided with full documents, not just Section 08 71 00 Part 3 hardware group/sets as that process does not meet Contract requirements.
3. Means and method type work includes, but is not limited to, coordination with plans and other specifications, templating, Section 08 71 00, and other Division 08 Section engineering and coordination. Starting submittal work or labor before means and method type work is completed does not constitute change orders.
4. Provide RFIs (request for information) for clarification items before submittals. This Section is not to be a stand-alone submittal but requires multiple Sections and Drawings coordination before submittals will be reviewed.
    a. Coordinate length and sizes for hardware devices before submittals, Verify the door hardware is compatible for use with the doors and door/frames.
    b. Report all prevailing conditions that will adversely affect satisfactory execution of work before submittals.
        1) Example: If door stiles would inhibit the use of specified hardware, provide RFIs before starting detailed hardware headings or group submittal process.
    c. This Section clarification items (RFIs) shall be reviewed by a non-design team coordinator before sending to design team for review.
        1) For clarification items that are means and methods (directed to or from one vendor to another vendor, framer/installer), Contractor shall coordinate and answer or list questions that are not design scope.
5. Multiple submittals for this Section work will not meet Contract requirements. Exceptions are as follows:
    a. Submittals may be broken up into different door vendor packages (for example: one glazing vendor package, one hollow metal and wood door vendor package, one fire-rated aluminum vendor package, one non-rated aluminum/storefront vendor package, one gate vendor package, one auto operator vendor), but breaking each of these packages into multiple or separate packages is not permissible (example: separate project buildings or different floors broken out not permitted).
    b. Frames that are required to be ordered early in the build process (under ten frames / openings required to meet project deadlines for early site work) may be broken into separate packages but remaining hardware in these packages will be rejected and not reviewed.
6. Coordinate with door/frame internal reinforcement for door hardware. In particular, coordinate door preparation in accordance with applicable regulatory and trade standards specified.
7. Coordinate keying requirements with all openings with one Vendor. For keying scope, even if different Section door/frame/gate scope packages are submitted with different hardware schedule submittals, only one Section 08 71 00 supplier is to oversee, coordinate, submit, furnish, and install keying. Coordinate per Section 08 71 00 and per means and methods before submits begin.

8. To detail submittals and nomenclature for electrified hardware, review and coordinate electrical specifications and drawings for scope that could affect hardware selections:
    a. Scope includes, but not limited to, auto operator locations if related to project and/or access control if related to project and/or electrical Divisions 26-28 and applicable Drawings.
    b. For electrified hardware interface with non-Division 08 access control or electrified tasks, the non-Division 08 access control or security vendor task shall provide a written agenda/plan how access control or security scope will be installed for a complete and operational system. Written agenda shall include power requirements and additional relays at no additional cost.
    c. For electrified hardware interface with non-Section 08 71 00 auto operator devices, the Section 08 71 13 auto operator vendor task shall provide a written agenda and plan how auto operator scope will be installed for a complete and operational system. Written agenda shall include power requirements and additional relays at no additional cost.

D. Hardware Schedule:
    1. Submit required vendor qualification letters and documentation (see above “QUALITY ASSURANCE”).
    2. Non-design team coordination and requirements:
        a. Submittals for coordinated door/frame/hardware items, shall be submitted at the same time for review of total opening requirements. Do not submit Section 08 71 00 scope without coordinated door and frame packages and above RFI/clarification process tasks completed. Submittals that do not include related doors/frames will be returned for correction before checking.
        b. Section submittals and/or shop drawings to be reviewed and have comments by non-design team (Contractor) before sending to design team. If submittals do not meet Contract requirements, return to hardware vendor for re-submittal. In many cases, unacceptable submittals are passed though without non-design team (Contractor) comments (coordinate per Contract).
    3. Submit hard copies of hardware schedule (number of copies per Division 01) as well as submit editable, PDF files via electronic email of ftp site process in Vertical Format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. https://www.hagerco.com/blog/2015/01/28/door-hardware-submittals/ Horizontal-type schedules will be returned for correction before reviewing.
        a. Shop drawings / hardware schedule shall clearly indicate each hardware group specified and manufacturer of each item proposed as well as each door number that the hardware is assigned to.

b. Vertical schedule format sample:

Heading Number 1 (Door Schedule or Architectural Assigned Hardware Group/Set number from part 3 = HW #__)					
1 Single Door #____ - Exterior from Corridor 101		Opening Size	90°	RH	Rating
Quantity	Device Description	Device # (include specification language)		Finish	Manu-facturer
4	Hinges	_____x fasteners			
1	Lockset	_____x fasteners		630	SC
1	I/C Cylinders	Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)		626	SC
1	Permanent Core	_____		626	SC
1	Stop and Holder	1261		626	TR
1	Door Silencers	SR64 or SR65 (as required)		GR	IV

4. Illustrations from manufacturer's catalogs and product data:
   a. Provide cut sheets and product data with vertical format hardware submittal (same timeframe) as well as door and frame information to be reviewed as one submittal package. Manufacturer's hard copy as well as PDF catalog cut sheets and product data shall not be submitted before editable, PDF files vertical format hardware submittal. See above Sequence of Format requirement. Catalog cut sheets and product data sent as submittals before the typed-out nomenclature of hardware part numbers (vertical format hardware submittal) will be returned without review.
5. Provide hardware schedule and hardware templates to door and frame manufacturer. Provide two templates to those manufacturers who are not currently registered template book holders.
6. Wiring Information: Provide manufacturers' wiring information including manufacturers' door elevation diagrams for electrified hardware based on Door Hardware Institute (DHI) core class "Electrified Architectural Hardware" DHI class #COR133. Openings where only magnetic hold-opens or door position switches are specified do not require wiring information. Provide information with hardware schedule submittal for review. Provide detailed wiring diagrams with hardware delivery to jobsite.
7. Review of schedules does not relieve the Contractor of providing all hardware required for complete and proper execution of the Work, whether or not such hardware was inadvertently omitted from Submittal.

E. Vendor meetings or coordination prior to purchasing materials:

a. Convene coordination meeting between all opening vendors and installers at least two weeks prior to purchasing doors, frames, door hardware, and electrical devices required for complete systems. Attendance includes but is not limited to hardware supplier and/or installer, door supplier and/or installer, frame supplier and/or installer, auto operator vendor and/or installer, security card reader vendor and/or installer, and electrical. If hardware changes are required due to these meetings, communicate changes to design team before ordering materials.

F. Templates:

1. Provide listing of manufacturer's template numbers for each item of hardware in hardware schedule.
2. Submit templates and "Reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.

G. Installation Instructions:

1. Provide manufacturer's written installation and adjustment instructions for finish hardware.
2. Send installation instructions to site with hardware.

H. Contract Closeout Submittals: Include specific requirements indicated below.

1. Operating and maintenance manuals: Submit three sets containing the following:
   a. Complete information in care, maintenance, and adjustment, data on repair and replacement parts, and information on preservation of finishes.
   b. Catalog pages for each product.
   c. Name, address, and phone number of local representative for each manufacturer.
   d. Parts list for each product.
   e. Copy of final accepted hardware schedule, edited to reflect "As installed".
   f. Copy of final keying schedule.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Storage: Store materials in a cool and dry location, elevated from the ground and protected from the elements, and secured from theft or pilferage.

1.8 WARRANTY

A. Comply with provisions of Division 01.

B. Warranty installed units shall be free from defects in material and workmanship as follows:

1. Continuous Hinges: Lifetime Warranty.
2. Locksets and Exit Devices: Three years.

3. Closers: Ten years.
4. All other hardware: Two years.

1.9 MAINTENANCE

A. Provide special wrenches and tools applicable to each special hardware component.

B. Provide maintenance tools and accessories supplied by hardware manufacturer.

PART 2 PRODUCTS

2.1 FINISHES

A. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices/finishes, along with added finishes below, as indicated on drawings and detailed requirements for each type of device:
   1. Typical BHMA finish designation references:
      a. BHMA 626 – Satin chromium plated brass or bronze.
      b. BHMA 628 – Satin or dull aluminum, clear anodized (uncoated).
      c. BHMA 630 – Satin stainless steel.
   2. Closers and Magnetic Holder (electrified, hold-open device):
      a. BHMA 689 – Sprayed aluminum paint finish.

2.2 RECYCLED CONTENT

A. Provide products with at least the following content:
   1. Mortise Locks: 40 percent post-consumer recycled content.
   2. Cylindrical Locks: 30 percent post-consumer recycled content.
   3. Closers: 30 percent post-consumer recycled content.
   4. Exit Devices: 40 percent post-consumer recycled content.
   5. Steel Hinges: 35 percent pre-consumer recycled content.
   6. Steel Kick Plates: 35 percent pre-consumer recycled content.

2.3 HARDWARE TEMPLATE

A. Make templates for hardware to be applied to metal doors or pre-finished doors.

B. Hinge templates shall conform to ANSI A156.7.

C. Promptly furnish template information or templates to door and frame manufacturers.

D. Coordinate hardware items to prevent interference with each other.

2.4 FIRE RATED DOORS AND EXIT DOORS

A. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device. Provide all specifications even if not written in hardware sets/groups.

B. Provide all hardware necessary to meet the requirements of CBC for fire doors and exit doors, as well as to other requirements specified, even if such hardware is not specifically mentioned under Article “Hardware Schedule” of this Section.

2.5 SCREWS, BOLTS, AND FASTENING DEVICES

A. At all locations, whether or not specified below, furnish and install with:

1. Provide exposed head x security torx fasteners/screws in countersunk holes. Exposed Screws, Bolts and Nuts to meet ASTM A307 Grade A.
2. Provide screws, bolts, washers, grommets, nuts, and other fastening devices of appropriate length, type, head, metal, and finish as necessary for proper match and application of hardware.
3. Provide screw thread adhesive sealant: Loctite No. 271 or accepted equal.
4. Provide nonferrous or corrosion-resistant steel fasteners exposed to weather.

B. Threshold anchors shall be Flat Sleeve Anchors cadmium plated expansion anchor screw in one unit.

2.6 HANGING HARDWARE

A. Gate Hanging Devices:

1. High Capacity Precision Engineered (heavy duty) hinges:
   a. A561 series hinges by ABH Manufacturing, 1222 Ardmore Ave. Itasca, IL 60143; (630) 875-9900; https://www.abhmfg.com/contact.
   b. Provide additional number of offset hinge devices to meet hinge manufacturer device warranty and gate warranty.
   c. Confirm hinge sizing with frame details. Unless otherwise specified All doors shall swing 180 degrees if opening will allow. Provide wide throw hinges where required. Provide widths sufficient to clear trim projection when door swings 180 degrees.
   d. Provide non-removable pins.
2. Gate hinges shall be fastened via fasteners (preferred) or if required welded in accordance with manufacturer’s recommendations.
   a. Coordinate with welding requirements in Contact Documents.
3. Provide devices ground smooth and painted to match gate/fence system – see Section 09 91 00 for paint and primer requirements. Products by the following manufacturers will be considered for acceptance providing all specified criteria have been met in full. Furnish all items and components of hardware required to complete the work in accordance with specifications, Contract Documents, and intended operation.
   a. Crown Industrial Manufacturing.

B. Butt Hinges:

1. Acceptable Manufacturers:
   a. McKinney Products Co.
   b. Ives Manufacturing by Allegion.
   c. Bommer Manufacturing.
   d. Stanley Works.

e. Hager Manufacturing.

2. Where hardware groups/sets have different information (number of hinges and sizing), refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device.
   a. Butt hinges shall be manufactured in accordance with ANSI/BHMA A156.1.
   b. Provide wide throw hinges where required:
      1) Submit and provide hinge widths sufficient to clear trim projection when door swings 180 degrees. All doors shall swing 180 degrees if wall allows.
      2) Utilize wide throw type hinges to clear frame or wall obstructions/cladding in order for doors to completely open. See 180 degree language above.
      3) Where a door closer device is specified and will be installed on pull side/hinged side of doors (i.e. closers will hit walls or other surfaces when door is completely open), provide wide throw type hinges to give sufficient pocket depth to hide closer behind door. Do not pinch or crush closer between the door and wall surface.
      4) Confirm hinge sizing with frame and wall details.
   c. Provide “weight/strength” as specified in hardware groups/sets in Part 3 (hinge nomenclature basis-of-design weight/strength).
   d. For doors 1-3/4 inches thick and up to 36 inches wide, provide hinge height of 4-1/2 inches.
   e. For doors 1-3/4 inches thick and 37 inches to 48 inches wide, provide heavy duty, four ball bearing hinges and height of 5 inches.
   f. If hardware sets specify height (example: 5 inches tall at 36 inch wide door), provide height as specified for project standards at these locations.
   g. Provide two butts for doors up to 60 inches high and one additional butt for each 30 inches of height or fraction thereof.
   h. Provide non-removable pins at exterior doors.
   i. Provide ball-bearing hinges. Non-ball-bearing hinges are not acceptable.
   j. Electric Hinges: Provide electrified hinges with certified UL Listed, concealed wires. Provide electric hinges with standardized wire colors to accommodate up to 12 wires (4, 6, 8 or 12 as required per to provide sufficient number of concealed wires to accommodate electric function of specified hardware). If additional wires are specified (more than needed for electrified devices), provide the wires specified.

C. Continuous Hinges:
   1. Acceptable Aluminum and Stainless Steel Manufacturers:
      a. Select Hinges.
      b. ABH Manufacturing.
      c. Markar Manufacturing.
      d. Pemko Manufacturing.
      e. Stanley Works.

2. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device:
    a. Provide widths sufficient to clear trim projection when door swings 180 degrees. Confirm hinge sizing with frame details. All doors shall swing 180 degrees if opening will allow. Provide wide throw hinges where required.
    b. Provide continuous hinge that meet cycle testing in accordance with ANSI/BHMA Standard A156.26, Grade 1.
    c. Stainless steel hinges shall meet abuse test per ASTM F1450.
    d. Aluminum material: Extruded tempered aluminum. Material Standard: 6063-T6 alloy. Configuration: Three interlocking extrusions in pinless assembly, installed to full height of door frame.
    e. Continuous hinges shall not obscure fire rated labels of the doors or frames.

2.7 SECURING DEVICES (LATCHING SYSTEMS)

A. Mortise Locksets, Latchsets, and Deadbolts:
    1. Acceptable Manufacturer:
        a. Schlage Lock Co. L9000 Series.
    2. Levers:
        a. Provide levers to return to door within 1/2 inch.
        b. Provide exterior side lever trim with vandal resistant feature (heavy duty lever trim designed to withstand abuse and vandalism):
            1) Schlage L9000 series Vandlgard™. Vandlgard example nomenclature: Storeroom Lockset LV9080 (added “V” nomenclature after the “L” nomenclature for lockset to have increased strength against abuse or vandalism) Locked lever freely rotates up and down while remaining securely locked. Provide seven-year warranty.
    3. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device:
        a. Locksets shall meet the requirements of ANSI/BHMA A156.13-1994, Operational Grade 1.
        b. Provide only thumbturn devices that meet accessibility requirements. Example: Schlage #L283-722 devices. No center pivoting thumbturns allowed.
        c. If deadbolts or lockbolts are utilized on the project, devices shall be interconnected with the latching mechanism on all egress doors to provide single movement function to unlatch doors.
        d. Backset: 2-3/4 inches. Provide minimum 1 inch throw stainless steel deadbolt Provide minimum 3/4 inch throw for latch bolt.
        e. Strikes:
            1) Provide ANSI 4-7/8 inch standard strike.
            2) Provide curved lip-type strike at all locations if possible to prevent catching clothing or other objects on strike. Where required, provide detail and flat strike.

3) Where required, provide extended lip strike so that the lock or latchset latch will not come in contact with frame or added trim on or adjacent to the frame. Example: Don Jo device #MEST-104, but provide submitted manufacturer equivalent extended lip strike.

B. Exit Devices and Removable Mullions:

1. Acceptable Manufacturers:
   a. Von Duprin.
   b. Sargent 80 Series.
2. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device:
   a. Exit devices shall be ANSI A156.3, Grade 1; UL Listed.
   b. All exit devices shall be UL listed for panic. Exit devices for labeled doors shall be UL listed as "Fire Exit Hardware".
   c. Provide cylinders for exit devices with locking trim and cylinder dogging. Provide cylinder dogging feature for non-rated exit devices.
   d. Where removable mullions are not specified in hardware groups, provide keyed removable mullions at all locations in order for door to properly latch and secure rooms and buildings with rim or mortise type exit/panic bar devices.
      1) Provide stabilizers for removable mullions at all locations.
   e. Whether or not specified throughout project, verify if Electrical, IDF and other rooms with electrical coordination have 800 amps or more than 800 amps housed within the rooms. At these rooms, if lever locksets are specified, credit the locking device and provide the Von Duprin mortise-type panic device #9975NL-F x 996L-M x key override.
   f. Trim:
      1) Where lever trim is specified, provide lever design to match lockset levers.
      2) Provide exit device lever trim with vandal resistant feature (heavy duty lever trim designed to with stand abuse and vandalism):
         a) Von Duprin 996 R/V.
         b) Sargent - Freewheeling Trim.
   g. Where indicated in hardware groups/ sets, provide exit/panic devices with non-electrified, photoluminescent coating with a visible EXIT sign that will illuminate in darkness or low lit areas and will recharges from ambient light.
   h. The unlatching force of panic hardware shall not exceed 5 pounds, applied in the direction of travel, certified by UL to meet requirements of CBC Section 11B-309.4 (Von Duprin nomenclature “AX”).
   i. All exit devices shall be shipped to project site with exit device, isometric cap as to not catch items on panic device push bar (Von Duprin nomenclature “PA”).
3. Provide panic devices complying with CBC Section 1010.2.9. The panic/exit device push-bar shall extend across no less than one-half the width of the doors/gates.

C. Flush Bolts and Dust Proof Strikes:

1. Acceptable Manufacturers:

a. Triangle Brass Manufacturing Company, Inc. (Trimco).

b. Rockwood.

c. Hager Manufacturing.

d. Ives Manufacturing.

2. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device:

a. Non-rated Openings: Where not specified in hardware sets, provide two flush bolts for inactive leaf of pairs of locked and latched doors. Locate centerline of top bolt not more than 78 inches from finished floor. Provide dustproof strike for bottom bolts, type as required for floor condition.

b. Rated Openings: Where not specified in hardware sets, provide automatic flush bolt set as applicable for inactive leaf of pairs of doors. Provide dustproof strike for bottom bolts, type as required for floor condition.

D. Coordinators:

1. Manufacturers:

a. Triangle Brass Manufacturing Company, Inc. (Trimco).

b. Rockwood.

c. Hager Manufacturing.

d. Ives Manufacturing.

2. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device:

a. Provide coordinator for fire rated or smoke labeled pairs of doors equipped with automatic flush bolts and those with vertical rod/mortise lock fire exit device combinations with astragals.

b. Provide filler bars for total opening width, closer mounting brackets to allow proper installation of stop mounted hardware without damaging coordinator, carry bars, and special preparation for top latches where applicable.

2.8 KEY SYSTEMS (CYLINDERS, CORES, AND KEYS.)

A. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device. Keying specifications below override hardware set/group nomenclature.

B. For all locking or dogging devices, provide complete cylinder system and coordination whether or not specified in Section 08 71 00, Part 3 hardware sets as required by locking device.

1. Different locking devices require a set of different requirements including, but not limited to, appropriate cams for mortise-type cylinders, appropriate tail pieces and size for rim-type cylinders, blocking rings as required for locking and cylinder devices to not rattle

and meet manufacturers' warranties, as well as cylinders that are to be coordinated with construction cores/cylinders and final pinned cores/cylinders shipped to Owner by Registered Mail per below to meet system requirements.

2. Scope is means and method type work by a certified locksmith and/or DHI individual to engineer rim or mortise cylinders and blocking rings or tail-piece components as required for submitted locking devices. Since there could be as many as 500 options for rim or mortise cylinders with the locking devices and different manufactures that may be submitted, this means/methods-type work is required (similar to templating doors and frames to accept hardware). Coordinate as required.

C. Gun Lockers:
   1. For all locking devices on Gun Lockers:
      a. Provide complete keying system whether or not specified in Section 08 71 00, Part 3 hardware sets including gun locker cylinders/cores, lock cores, mortise cylinders, and rim cylinders keyed as directed by Owner in submittal process.
      b. In addition to the devices specified in hardware group/sets below, coordinate devices in Section 11 98 26.13 and Section 11 98 36. Gun Locker permanent cylinders and keys in the following quantities (total quantity of keys part of bid package):
         1) 40 each: Rim or Mortise x appropriate cam x blocking rings as required; rim or mortise type and quantity as required by locking device.
         2) 40 each: Include cylinders above and 40 final cores also. Provide credit when the less expensive keying system submitted.

D. CABINET AND DRAWER LOCKS
   1. Provide locking devices for all project cabinets and locking drawers within the project. Provide Schlage interchangeable core/cylinder Classic E keyway series cores and keying system per below. Section 08 71 00 Vendor furnished/installed in cabinets and locking drawers. Owner locksmith to perform final keying per below.
   2. Acceptable Manufacturers:
      1) Schlage Lock Co.
      2) Olympus Lock Co.
   3. Furnish cabinets and locking drawers in the following quantities:
      1) 200 each = Cabinet Door Lock - CL777R. Include final core and keying per key systems below.
      2) 200 each = Drawer Lock - CL888R. Include final core and keying per key systems below.
      3) 200 each = Cam Lock - CL920R. Include final core and keying per key systems below.
      b. Coordinate with project cabinets and locking drawer Vendor for required quantity and types and credit un-used cabinet/locking drawer devices. Ship required and quantity directly to cabinet/locking drawer Vendor.

E. Key Systems (Cylinders, Cores, and Keys):
   1. Manufacturers:
      a. Schlage Lock Co.

2. For all locking or dogging devices:
    a. Provide complete keying system whether or not specified in Section 08 71 00, Part 3 hardware sets including gun locker cylinders/cores, lock cores, mortise cylinders, and rim cylinders keyed as directed by Owner in submittal process.
    b. Coordinate devices in Section 11 98 26.13 and Section 11 98 36. Gun Locker permanent cylinders and keys in the following quantities: (Total quantity of keys part of bid package):
        1) 6 each: Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device). For pricing use 20-757 or 20-763 system. Provide credit when the less expensive keying system submitted.
        2) 6 each: Include cylinders above and Schlage 20-765 final cores. Provide credit when the less expensive keying system submitted.
3. For all locking or dogging devices, provide complete keying system whether or not specified in Section 08 71 00, Part 3 hardware sets including lock cores, mortise cylinders, and rim cylinders keyed as directed by Owner in submittal process. Key System shall be:
    a. Patented Schlage Lock Co. Primus Level 3.
4. Keyway: Provide as instructed by Owner during submittal process.

F. Keying Requirements:
1. Provide keyed, construction cores and keys during the construction period.
    a. Provide full sized cylinders or brass construction cores and brass keys at all interior and exterior doors. Plastic cores are not permitted.
    b. Construction control and operating keys and core shall not be part of the Owner's permanent keying system or furnished in the same keyway or key section as the Owner’s permanent keying system. Permanent cores and keys prepared according to the accepted keying schedule shall be furnished to the Owner.
2. Keying Meeting and Programming Schedule:
    a. Do not provide keying matrix in original hardware submittals. After hardware has been submitted and reviewed in accordance with Division 01 and Section 08 71 00 requirements, arrange a keying matrix/programming meeting with Owner Representative and various hardware suppliers/vendors representing both the cylinders/keying system and different, reviewed submittals (design team not required).
        1) Copies of the reviewed door and frame submittals shall be brought to the meeting with card reader and keyed doors highlighted for review.
        2) Follow procedures for keying meeting and programming schedule as outlined by the Door Hardware Institute. DHI procedures are based on Door Hardware Institute core class entitled Masterkeying class #AHC200.
        3) At doors for Pharmacy or Medication dispensing rooms provide keying with patented keyway not utilized by the rest of the facility.
    b. Keying meeting to produce a programming schedule/matrix based on the following:
        1) Furnish keys in the following quantities (total quantity of keys part of bid package):
            a) 5 each Grand master-keys per set.
            b) 6 each Masterkeys per set.

c) 3 each Change keys each lock, core or cylinder.

d) 5 each Permanent Extractor keys.

e) 9 each Construction masterkeys.

f) 2 each Construction Core Extractor keys.

2) Provide keying system expansion parameters.

a) Plan twenty changes directly under the grand.

b) Plan ten master keys.

c) Plan fifty changes each for each master.

3) Permanent keys and cores shall be stamped with the applicable key mark for identification. The visual key control marks or codes shall not include the actual key cuts.

4) Permanent keys shall be stamped "Do Not Duplicate".

c. Furnish typed programming meeting matrix and notes in PDF, editable electronic format as well as mailed, hard copy to Owner Representative for final review.

d. Furnish keying and programming schedule to key/core/cylinder manufacturing factory for production of key/core/cylinder devices.

e. Transmit pinned cores/cylinders as well as cut grand masterkeys, masterkeys, change keys and other security keys to Owner locksmith, by Registered Mail, return receipt requested. All permanent cores and keys shall be sent directly from the factory to client for ID and verification.

1) General Contractor shall install all permanent cylinders and/or cores in permanent locking or keying housings only while accompanied by County or Correctional representatives during all installations. Installation of permanent cylinders and/or cores in permanent locking or cylinder housings shall occur after substantial completion and prior to final completion. General Contractor shall also be responsible for preparing locking systems, installation ready for final cylinders and/or cores, free from dirt, debris or overtightening of locking devices that my cause binding of keyed devices.

2) Provide instructions for adjustments and maintenance of hardware and hardware finishes.

G. Key Cabinets:

1. Manufacturer:

a. Basis-of-Design: Lund Deluxe wall type cabinet, Series 1200.

2. Acceptable Manufacturers, if meeting specifications below:

a. Telkee Incorporated.

b. Key Control Manufacturing.

3. Provide cabinet with one hook for each lock or cylinder plus at least 50 percent extra hooks.

4. Provide each hook with one non-removable security key tag and one snap-on link duplicate key tag.

5. Provide tools, instruction sheets, and accessories required to complete installation.

6. Owner will place keys in key cabinet and complete index cards furnished with key system.

H. Key Management Software:

1. Provide key management software: Sitemaster 200 3.0 version system by Schlage.
2. Software shall provide tracking, issuing, collecting, and transferring information regarding keys, doors, and hardware.
3. Provide training for Owner's personnel on the proper operation and application of the key management software. Provide sixteen hours total training time that includes travel expenses by a certified Manufacturer software trainer.

2.9 CLOSING DEVICES

A. Surface Mounted Closers:

1. Acceptable Manufacturers:
   a. LCN Manufacturing – 4050A Series as scheduled.
   b. Norton Door Controls – 7500 Series.
   c. Dorma – 8916 Series.

B. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device:

1. ANSI A156.4, Grade 1; UL Listed; meets UL 10C and SFM Standard 12-7-4 for positive pressure fire test.
2. ANSI A156.4, Grade 1; UL Listed; meets UL 10C and SFM Standard 12-7-4 for positive pressure fire test. Whether or not specified in hardware groups/sets, submit 4050A or approved equal closer at all openings that are smoke-rated or fire-rated even if closer is omitted from groups/sets.
3. Closers shall have multi-size spring power adjustment to permit setting of spring from 1 through 6 with additional spring power available. Provide ADA compliant setting nomenclature during submittals as recommended by closer manufacturer.
4. Submit correct closer type as to be able to install closers on non–public side of doors (examples include but are not limited to 1) interior side of storage/electrical type rooms; 2) not in corridors/public areas. At exterior locations, install closers inside of building (in conditioned spaces).
5. Installation Plates, Brackets, and Miscellaneous Adapters:
   a. Provide drop plates, brackets, or adapters for arms as required to suit details and install as directed by manufacturer's templates.
      1) Furnish and install drop plates at reverse bevel doors and at doors with 170 degrees to 180 degrees swing.

2) Furnish and install blade, angle or applied stops as required where frame does not permit installation of the standard soffit plate (see example LCN #419 Flush Panel Adapter to be shown in submittals below). If LCN or equal manufacturer #419 Flush Panel Adapter is not in submittals as required for transom panel applications or if other drop plates, blade, angle or applied stops are not in submittals the submittal will be marked revise and resubmit. After doors are installed, hardware Vendor to field verify additional brackets and shims required before installing closers. Provide written language in submittals for how areas requiring special applications will be installed.

2.10 AUTOMATIC OPERATORS

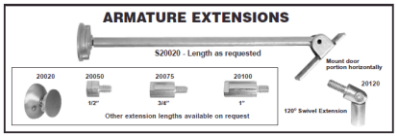
A. See Section 08 71 13.

2.11 STOPS AND HOLDERS

A. Overhead Door Holder/Stops:
   1. Acceptable Manufacturers:
      a. Rixson Manufacturing.
      b. ABH Manufacturing.
      c. Glynn Johnson.
   2. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device.
      a. Overhead Stops and/or Holders shall meet the requirements of BHMA A156.8, Type 1, Grade 1.
      b. If overhead stops are specified in hardware groups/sets, do not provide wall or floor stops as alternative method of stopping door.
      c. If manual overhead “stop and hold-open” type devices are specified on fire-rated doors, provide the non-hold open function at time of submittals. Manual hold opens not allowed on fire rated doors.

B. Floor and Wall Door Stops/Holders and Bumpers:
   1. Acceptable Manufacturers:
      a. Ives Manufacturing.
      b. Triangle Brass Manufacturing Company, Inc. (Trimco).
      c. Rockwood.
      d. Hager Manufacturing.
      e. Southern Steel Manufacturing (no substitution where specified).
   2. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device:
      a. Stops, Bumpers and/or Holders shall meet the requirements of BHMA A156.16, Grade 1.
      b. Coordinate with specifications in Section 05 40 00 and Section 09 22 16 for required wall backing.

3. Acceptable Manufacturers:
    a. ABH Manufacturing.
    b. LCN Manufacturing.
    c. Rixson Manufacturing.
4. Coordinate with specifications in Section 05 40 00 and Section 09 22 16 for required wall backing.
5. Coordinate with Divisions 26-28 for electrical work.
    a. Description of Operation: When door is placed in opened position, magnetic holder shall automatically engage hold open mechanism (magnet).
    b. Door releases hold open and fully closes door by manual pulling of door or by the following, self-closing functions:
        1) Close on fire alarm activation. Verify voltage and coordinate integration with fire alarm system; or
        2) Close due to loss of power. Coordinate integration with local power system.
6. At all locations utilizing hold open magnetic devices provide correct armature length for doors (example of armature lengths in snippet/picture below).
    a. Where doors will open 90 degrees or 180 degrees, swing parallel or against adjacent wall provide length required to make door 90 degree or 180 degree preferred in open position.
    b. At conditions where doors open between 90 degrees and 180 degrees, provide armature arm application and length so that door will reach wall condition and hold doors open until fire or other alarms drop power and close doors automatically.
    c. Hinge and closer coordination is required for doors that swing more than 90 degrees. Provide wide throw type hinges to clear all frame or wall obstructions in order for doors to fully open and to hide closer behind door when door are flat against a wall.



2.12 ACCESSORIES

A. Kick/Mop Plates:
    1. Acceptable Manufacturers:
        a. Triangle Brass Manufacturing Company, Inc. (Trimco).
        b. Ives Manufacturing.
        c. Rockwood.
        d. Hager Manufacturing.

B. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device.
    1. Coordinate length and sizes for hardware devices before ordering materials (verify the door hardware is compatible for use with the doors and door/frames). Protection plate example: LDW nomenclature in Part 3 means “less door width”. A 48 inch wide door

would have a 46 inch wide protection plate. Width shall be one inch less than door width unless doors have protective edge guards or center mullions. Coordinate before submittals.

2. At rated doors (UL smoke or fire), furnish protection plates with engraved UL listing information. Example: Trimco added part #ULS added to all kickplates specified below that are on UL or rated doors/openings.

C. Push/Pull Plates:

1. Provide pulls at specified doors/openings. Where Trimco pulls are specified, provide request for substitution for matching pulls and/or pull manufactures.
2. Acceptable manufacturers, if meeting specifications below (provide samples for review).
   a. Ives Manufacturing.
   b. Rockwood.
   c. Hager Manufacturing.

D. Lock Guards:

1. Acceptable Manufacturers:
   a. Ives Manufacturing.
   b. Triangle Brass Manufacturing Company, Inc. (Trimco).
   c. Rockwood.
   d. Hager Manufacturing.

E. Smoke Seals, Intumescent Seals, Sound Seals, and/or Weatherstripping.

1. Acceptable Manufacturers:
   a. Pemko Manufacturing, Inc.
   b. National Guard Products (NGP).
   c. Zero International.
2. No intumescent material is allowed on door frames. Where CBC requirements for positive pressure must be met, doors shall include all requirements as part of the door construction per 'Category A' guidelines as published by ITS/Warnock-Hersey.

F. Light or Sound Seals:

1. Acceptable Manufacturers:
   a. Pemko Manufacturing, Inc. Basis-of-Design: 29310CS or 350CSR adjustable seals.
   b. National Guard Products (NGP).
   c. Zero International.
2. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device:
   a. In the field cutting or notching of sound gasket hardware shall not be permitted.
   b. Submit and supply STC type gasketing in lengths appropriate for template hardware. Examples below are not exhaustive; see hardware and door templating requirements.
      1) When rim-type exit/panic devices are used in conjunction with the STC type gasketing, order different lengths of STC type gasketing for latching side jamb to

coordinate with -type exit/panic device, surface mounted latch. Do not install seal at roller-type latch location.

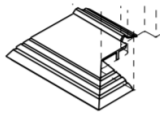
2) When stop mounted overhead closer devices are used in conjunction with the STC type gasketing, provide the correct drop plates, brackets, and/or closer arms to not cut or notch the STC type gasketing. Provide full, header width of STC type gasketing. Example: If a parallel arm closer is utilized then provide offset arms like those used for surface mounted overhead stops, drop plates, and brackets. Example strike plate mounting bracket #770SPB by Zero International manufacturing or approved equal to coordinate with each different application.

G. Door Silencers:

1. Acceptable Manufacturers:
   a. Ives Manufacturing.
   b. Triangle Brass Manufacturing Company, Inc. (Trimco).
   c. Rockwood.
   d. Hager Manufacturing.

H. Astragals, Door Bottoms, and Thresholds:

1. Acceptable Manufacturers:
   a. Pemko Manufacturing, Inc.
   b. National Guard Products (NGP).
   c. Zero International.
2. Thresholds shall comply with CBC 2022 and shall not exceed 1/2 inch in height.
3. Whether or not wider thresholds are specified below, thresholds shall not extend past door frame in interior conditions. Detail as part of engineering/shop drawings/means and methods before submittals. Thresholds that extend past door frame in exterior conditions shall wrap frame stops. Cut around stops, then continue into rabbits and face of frame.
   a. Whether or not specified below, where thresholds are larger than frames all thresholds to have beveled miter ends.
   b. 45-degree miter cut and a closed end, welded with returns to door/frame. Example: NGP manufacturing nomenclature RCE throughout.



4. Thresholds shall wrap frame stops. Cut around stops, then continue into rabbits and face of frame.
   a. Whether or not specified below, where thresholds are larger than frames all thresholds to have beveled miter ends.
   b. 45-degree miter cut and a closed end, welded with returns to door/frame. Example: NGP manufacturing nomenclature RCE throughout.

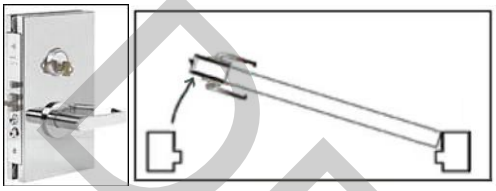
I. Drip Guard:

1. Provide at exterior doors exposed to rain.

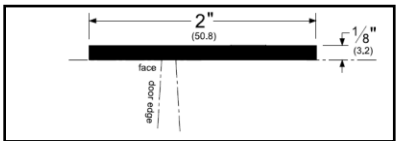
2. Size: Full Frame Width (FFW).
3. Provide devices painted to match adjacent frame. See Section 09 91 00 for paint and primer requirements.

J. Gates and Gate Hardware Accessories:

1. Provide welded astragals, lock patches (templates), and/or welded mounting devices required for a complete installation of specified hardware, whether or not shown on Drawings and details. Weld in accordance with manufacturer's recommendations. Provide devices ground smooth and paint to match gate/fence system. See Section 09 91 00 for paint and primer requirements. Inserted pictures below are examples of lock patches and/or welded mounting devices. Template gates for each type of hardware device.



2. Gate Astragal:
   a. Provide fully welded astragal full height of gate to overlap either adjacent fence post or the adjacent gate at pair of gates.
      1) Provide full height astragal in width indicated on Drawings. If not indicated, provide astragal width no less than 2 inches wide. See inserted picture below.
      2) Provide full height astragal overlap width per details. If not indicated, provide overlap of astragal no less than 3/4 inch wide.
      3) Provide 1/8 inch astragal thickness. See inserted picture below.
      4) Where Pemko Manufacturing 357 Series astragal is utilized by gate manufacturer, do not use screws or order with screw holes. Nomenclature: ND prefix or suffix required by Pemko on 357 Series astragal.



   b. Provide devices ground smooth and painted to match gate/fence system. See Section 09 91 00 for paint and primer requirements.
3. Gate Canebolts:
   a. Where nomenclature or device "524 Series" non-padlock canebolt-type devices are specified in hardware group/sets, provide by Crown Industrial, South San Francisco, CA; (650) 952-5150; http://www.crown-industrial.com/, or accepted equal.
   b. Where nomenclature or device "stock #0524PL and/or part #0000478" series padlockable canebolt-type devices are specified in hardware group/sets, provide series by Crown Industrial, South San Francisco, CA; (650) 952-5150; http://www.crown-industrial.com/, or accepted equal.
   c. On pairs of gates that have egress lever trim and or exit/panic device push-pad trim on active side gate, install canebolt away from the door edge so that both the canebolt and supplied the padlock cannot not impede the active gate from opening at any time, providing free egress.

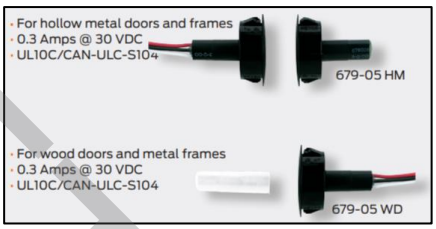
d. Provide compatible galvanized steel pipe canebolt receptor and strike plate mounted in concrete slab as required.
   1) At padlockable canebolts, provide sufficient canebolt receptor depth to enable use of padlock.
   2) Provide canebolt receptors at both closed position of gate and open position of gate at 90 degrees, unless shown differently on Drawings.

e. Canebolts shall be mounted and welded in accordance with manufacturer's recommendations.
   1) Coordinate with other welding requirements in Contract Documents.
   2) Provide devices ground smooth and painted to match gate/fence system. See Section 09 91 00 for paint and primer requirements.

f. Products by the following manufacturers will be considered for acceptance providing all specified criteria have been met in full. Furnish all items and components of hardware required to complete the work in accordance with specifications, Contract Documents, and intended operation.
   1) Guardian Gate; www.guardiangatehardware.com.
   2) Ameristar.
   3) Monumental Iron Works.

2.13 POWER SUPPLIES, ELECTRIFIED HARDWARE, AND WIRES

A. Door Position Switches



1. Acceptable Manufacturers:
   a. #679-05-WD or #679-05-HM (as required per door material) by Schlage manufacturing.
   b. General Electric.
   c. Securitron.
2. Where hardware groups/sets have different information, refer to the following specifications for clarification and submit according to complete and intended electrified system per Contract Documents. See Architectural and Security drawings and specifications.
   a. Coordinate door and frame preparations with door and frame suppliers.
   b. Switches shall be installed in frame head approximately 4 inches from latching door edge. See security drawings for additional coordination.

B. Power Supplies, Wires, and Relays:

1. Where hardware groups/sets have different information (number of hinge wires and power supply information), refer to the following specifications for clarification and submit according to complete and intended electrified system per Contract Documents. See Architectural and Security drawings and specifications.
   a. Coordinate use of power supplies with door and frame locations. Provide power supplies, relay, and battery backup units as part of the overall system in accordance with the manufacturer's warranty and system requirements. UL listed for applicable use; housed in an accepted enclosure; and provide both Class 1 and Class 2 outputs.

b. Output shall be filtered and regulated. Relay, timer, and logic modules shall be provided as required for interface to indicated security components, and shall be assembled, connected, and fully contained within the power supply enclosure.

c. Provide required connections to accommodate fire alarm/life safety system and/or security electronics for remote site monitoring of all electrified components and functions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine doors and frames and verify mounting locations as indicated on shop drawings.

B. Report unacceptable conditions to the Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 INSTALLATION

A. Install in accordance with manufacturer's printed instructions and accepted shop drawings.

B. Door-Floor Clearances:

1. Unless otherwise shown, provide the following door-floor clearances:
   a. Maximum 5/8 inch where no sill exists.
   b. Maximum 5/8 inch above raised sill/threshold.
2. Undercut doors so that the sweeps still fit tight against the sill or threshold condition, but as the door opens and sweeps away from sill or threshold, the door bottoms do not rub on the floor. Metal installation parts of door bottoms are typically part of the door assembly and only the gap between the metal part and sill/threshold are seen as the undercut. Means and methods: coordinate as required for door and hardware with finish floors, toppings, thresholds, and performance ratings.

C. Hardware Placement:

1. Unless otherwise shown or required by CBC 2022, ADA Act - 2010 Standards for Accessible Design and/or Title 24, place hardware at the following heights:
   a. Hinges: Door and frame manufacturer's standard or existing location scope per additional specifications and plans.
   b. Lever handles for latchsets, lockset and panic/exit device pull, lever trim:
      1) 38 inches above finish floor/surface.
      2) Verify manufacturer's template with door design.
   c. Panic devices push bar:
      1) Panic hardware shall be so mounted / centered between 36 inches and 44 inches above finished floor or ground per 11B-404.2.7.
      2) Verify manufacturer's template with door design to meet CBC.
   d. Door Pulls and Push Bars (centerline): mounted / centered 42 inches above finished floor or ground.
   e. Door Push Plates (centerline): mounted / centered 42 inches above finished floor or ground.

f. Where slider doors are in the fully open position, operating hardware shall be fully exposed and usable from both sides per CBC Section 11B-404.2.7.

g. Closers:

1) To meet opening force requirements.

2) See installation below.

2. Hardware for door handles, pulls, latches, locks, and other operating devices for use on means of egress doors shall comply with SFM Standard 12-10-2, Section 12-10-202 as contained in CCR Title 24, Part 12.

D. Installation:

1. Except for hinges, do not install hardware until painting and finishing work is completed.
2. Pre-drill pilot holes in wood for screws. Drill and tap for surface mounted hardware on metal.
3. Hinges: Set hinges snug and flat in mortises. Hand turn screws to flat seat – do not drive.
4. Locksets: Install locks with keyways in proper position. Install levers, roses, and escutcheons firmly affixed.
5. Closers:

a. To open and latch smoke or fire rated doors correctly (positive latch at all times for rated doors when door is not in use), install closer units per factory templates to meet manufacturer requirements.

b. To meet non-rated opening/exterior opening force requirements as well as close and latch non-smoke non-fire rated doors:

1) Closers are to be installed as close to the hinge side of door as possible by a trained installer per this Section, Part 1 “Quality Assurance, Installer Qualifications”, installer an authorized representative of manufacturers, minimum of five years successful experience installing closers to meet 5-pound opening force for non-rated door complexity”.

2) For non-smoke or non-fire rated doors, before installation of closers, install one mockup door for each kind of closer application. Example: parallel, regular arm, stop arm and/or top-jamb arm application if specified. Confirm doors meet 5-pound opening force and still close door. This will ensure proper installation for doors to open at 5 pounds opening force before remaining non-rated opening closers are installed.

c. Mount door closers for maximum swing but at non-rated doors to meet 5-pound opening force. At all possible openings, mount door closers for maximum swing of door before setting stops.

d. Mount door closers for maximum swing, but at non-rated doors to meet 5-pound opening force. Drawings may show doors open to only 90 degrees (Revit or CAD system set up), but unless noted or specified with limiter (stop arm devices below), all doors to open for maximum swing against adjacent 180 wall if nothing inhibits door from doing so. Include wide-throw hinges per specs and installation for 170 degree to180 degree or maximum swing of door before installing stops.

6. Floor Stops: See notes on closers and hinges above. After closing devices are opened as far as possible without occupant excessive force (at substantial completion), stops shall be installed a maximum of 4 inches from adjacent walls and as far away from the hinge point as possible. Preference is to have stops installed just below lever or pull

locations.

7. Auto Door Bottom to not be adjusted until substantial completion. Door bottoms are to be raised to highest position while construction occurs so to not have rubber seal torn or damaged by debris under the door. At substantial completion, adjust door bottom to fully engage and touch the floor for proper sound dampening.
8. Silencers: Set in place before adjusting strikes.
9. Thresholds and Raindrips: Set in waterproof sealant and fasten anchors in pre-drilled countersunk holes 18 inch on center maximum spacing and within 3 inches of each end. Minimum three anchors per threshold.

3.3 PAINT OR FIELD FINISHES

A. Coordinate with Contact Documents including, but not limited to, Section 09 91 00 for paint and primer requirements.

B. Fire rated labels on doors and frames shall not be painted.

3.4 ADJUSTING

A. Adjust parts for smooth, uniform operation.

B. Lubricate moving parts with manufacturer recommended lubricant.

C. Replace units that cannot be adjusted and lubricated to operate freely and smoothly as intended for the application.

D. Adjust door closer devices:
   1. Adjust closer operating.
      a. Interior and Exterior Doors: not to exceed 5.0 pounds force.
      b. When fire doors are required, the maximum effort to operate the door may be increased to the minimum allowed by the appropriate administrative authority, not to exceed 15 pounds opening force.
   2. Adjust closer delay and operating speeds to comply with requirements of 2022 CBC Section 11B-404.2.8.1 and ADA – Americans with Disabilities Act - 2010 Standards for Accessible Design.
      a. Doors/gates closers, when provided, shall have sweep period adjusted: minimum of 5 seconds for a door/gate to close from the 90 degree position to the 12 degree position.
      b. Doors/gates with spring hinges require a minimum of 1.5 seconds to close from the 70 degree to the closed position.

3.5 CLEANING

A. Clean as recommended by manufacturer. Do not use materials or methods which may damage finish or surrounding construction.

3.6 HARDWARE SCHEDULE

A. Manufacturers Legend:

Code	Name
MC	McKinney Manufacturing
SE	Select Manufacturing
SC	Schlage Manufacturing
LC	LCN Closers
VO	Von Duprin Manufacturing
IV	H.B. Ives
PE	Pemko Manufacturing
TR	Trimco Manufacturing
RX	Rixson Manufacturing
SN	Securitron Manufacturing
SS	Southern Steel Manufacturing
AB	ABH Manufacturing

B. The “Request-to-Exit” feature as described below is a security feature that announces/tells the security system if occupant is leaving the building interior area and similar to a motion-sensor the “Request-to-Exit” switch or device does not affect egress of the doors. Unless noted, all doors in hardware group/sets are free egress at all times with no special knowledge to exit.

C. Hardware Columns - Example (Legend):

Qty	Device Description	Device # (include specification language)	Finish	Manu
1	- - - - - - - - - - - -	- - - - - - - - - - - -	- -	- -

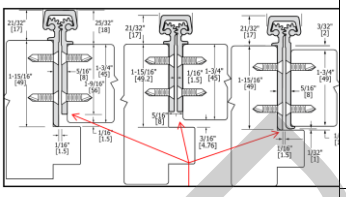
D. The following hardware sets are intended to establish type and standard of quality when used together with the requirements of this Section. See above Section and related Sections including Division 01.

1. Examine Contract Documents and furnish proper hardware for door openings.
2. Refer to Door Schedule on the Drawings for Hardware Group/Set assignments for each opening.

Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages

Exterior Hardware Sets (Typically Two-Digit Set Numbers)

Hardware Group/Set #01

In addition to the devices specified in hardware group/set below, also coordinate devices in specification Section 08 71 13 “Automatic Door Operators” and Electrical/Security (furnish and install doors, frames and related scope per complete Contract Documents):					
1	Ea.	Continuous Hinge with Electrified Power Transfer 	SL11-HD device (120 inch or length as required for door height). Provide special Select manufacturing set-up for wires: Select manufacturing #ATW accessible through wire transfer. Per specifications whether or not marked throughout all, verify for proper hinge type before submittals. Do not submit hinges until verified for correct hinge application per opening (means and methods not by designer).	AL	SE
1	Ea.	Electrified Rim-Type Exit/Panic Device (Special Cylinder Dogging and Key Override)	QELX-HD x RX 99NL x 110NL series x security torx fasteners	626	VO
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Offset Pull	AP423-J-24” x 316S (do not block emergency key override) in marine grade 316 stainless steel	316 S	TR
1	Ea.	Auto Operator, Push-Plates and System Components	Concealed Auto Operator complete system per Section 08 71 13 “Automatic Door Operators”		
1	Ea.	Stop (installed only after punch walk/substantial completion).	Auxiliary Stop 1280. After auto operator is opened as far as possible with motor driven power only (without occupant excessive force), install stop no more than 4” from frame/hinge, quarter inch past the most open position of the auto operator).	630	TR
1	Ea.	Seal	Seals are to be furnished by aluminum door/frame manufacturer (head, jambs, meeting stiles for pair doors)		
1	Ea.	Door Bottom	315CN by Pemko or approved manufacturer.		
1	Ea.	Threshold	158A offset or 171A flush condition (or per detail for flat of quarter inch offset sill detail) x wrap frame stops x beveled miter ends x mastic per specifications x by Pemko approved equal		
1	Ea.	Door Position Switch (also known as Alarm Contact, Door Contacts)	#679-05-WD or #679-05-HM (as required per door material) by Schlage manufacturing (coordinate with Divisions 26-28 and applicable drawings).		
1	Ea.	QELX Power Supply	Furnish and install #1) single gang power drop located above or near door (not in corridor or public view, but above celling line where possible); #2) provide power supply # PS904 4 RL with 900-BB (battery backup for additional auto operator opening cycles when there is power loss); #3) run conduit from hinge through frame and complete wiring as required to meet manufacturer warranties		

1	Ea.	Request to Exit Device (see free egress note in above specifications)	Specified in above locking hardware (coordinate with Divisions 26-28 and applicable drawings).
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. - Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include card reader locations.
Note 1: Balance of perimeter seals and meeting stiles by door manufacturer. Note 2: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents). Example: Hardware, whether marked or specified in Part 3, to have security torx fasteners/screws per specifications.			

Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages

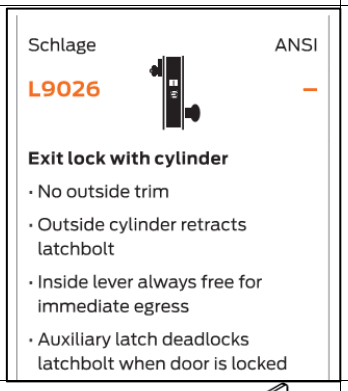
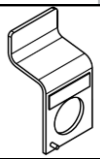
Hardware Group/Set #02

_	Ea.	Hinges	T4A3386 x NRP (size and quantity per Section 08 71 00) x NRP	630	MC
1	Ea.	Electrified Transfer Hinges	T4A3386 QC8 (8-wire, size per Section 08 71 00)	630	MC
1	Ea.	Electrified Rim-Type Exit/Panic Device (Special Cylinder Dogging and Key Override)	LD QELX x RX 99NL x 110NL series x security torx fasteners	626	VO
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Anti-Vandal Pull x Latch Guard	1096HA-FC x marine grade premium "316" stainless steel finish. Coordinate with exit device Night Latch, cylinder and rings before submittals	316 S	TR
1	Ea.	Closer	4050A x EDA arm (installed push-side of door and swing out 180 degrees) x with Special Rust Inhibitor (SRI)	689/ SRI	LC
1	Ea.	Stop (installed only after punch walk/substantial completion).	Auxiliary Stop 1280. After closer is opened as far as possible (without occupant excessive force), install stop no more than 4” from frame/hinge, quarter inch past the most open position of the auto operator).	630	TR
1	Ea.	Seal (weatherstripping)	S88D (head and jambs) by Pemko or approved equal.		
1	Ea.	Door Bottom Sweep	216A x security torx fasteners by Pemko or approved equal.		
1	Ea.	Threshold	158A offset or 171A flush condition (or per detail for flat of quarter inch offset sill detail) x wrap frame stops x beveled miter ends x mastic per specifications x by Pemko approved equal		
1	Ea.	Overhead Rain Drip	Per architectural details and flashing at uncovered areas (no water penetration; verify before submittals). For hollow metal doors, provide 346C x FFW full raindrips by Pemko or approved equal.		
1	Ea.	Door Position Switch (also known as Alarm Contact, Door Contacts)	#679-05-WD or #679-05-HM (as required per door material) by Schlage manufacturing (coordinate with Divisions 26-28 and applicable drawings).		
1	Ea.	QELX Power Supply	Furnish and install #1) single gang power drop located above or near door (not in corridor or public view, but above celling line where possible); #2) provide power supply # PS904 4 RL with 900-BB (battery backup for additional auto operator opening cycles when there is power loss); #3) run conduit from hinge through frame and complete wiring as required to meet manufacturer warranties		
1	Ea.	Request to Exit Device (see free egress note in above specifications)	Specified in above locking hardware (coordinate with Divisions 26-28 and applicable drawings).		
1	Ea.	Coordination task for security and/or electrical design and additional	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked		

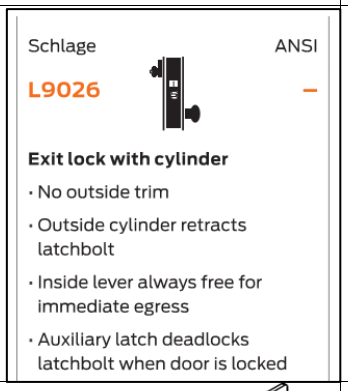
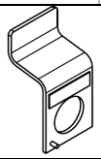
		non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	/ locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. - Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include card reader locations.
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).			

Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages

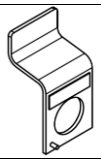
Hardware Group/Set #03

_	Ea.	Hinges	T4A3386 x NRP (quantity and size per Section 08 71 00)	630	MC
1	Ea.	Auto Flush Bolt	#3820 x #3810 and dust proof strike device #3911	626/ 630	TR
1	Ea.	Storeroom Locksets	L9026T x #06 Lever x A rose no exterior lever prepared and coordinated with Z-Pull (installed facing downward, not up) for ADA key override pull 	630	SC
1	Ea.	Z-Pull	#1822-3-P.630 series installed face down and templated center hole for final cylinder and rings to be installed over #1822-3-P.630 	630	TR
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
2	Ea.	Overhead Stop	9ADJ Series (-336 or size as required)	630	RX
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Seal (weatherstripping)	S88D (head and jambs) and S77D at astragal by Pemko or approved equal.		
2	Ea.	Door Bottom Sweep	216A x security torx fasteners by Pemko or approved equal.		
1	Ea.	Overlapping Astragal	139SS-brushed stainless steel finish by NGP or approved equal		
1	Ea.	Threshold	158A offset or 171A flush condition (or per detail for flat of quarter inch offset sill detail) x wrap frame stops x beveled miter ends x mastic per specifications x by Pemko approved equal		
1	Ea.	Overhead Rain Drip	Per architectural details and flashing at uncovered areas (no water penetration; verify before submittals). For hollow metal doors, provide 346C x FFW full raindrips by Pemko or approved equal.		
2	Ea.	Door Position Switch (also known as Alarm Contact, Door Contacts)	#679-05-WD or #679-05-HM (as required per door material) by Schlage manufacturing (coordinate with Divisions 26-28 and applicable drawings).		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #04

_	Ea.	Hinges	T4A3386 x NRP (quantity and size per Section 08 71 00)	630	MC
1	Ea.	Storeroom Locksets	L9026T x #06 Lever x A rose no exterior lever prepared and coordinated with Z-Pull (installed facing downward, not up) for ADA key override pull 	630	SC
1	Ea.	Z-Pull	#1822-3-P.630 series installed face down and templated center hole for final cylinder and rings to be installed over #1822-3-P.630 	630	TR
1	Ea.	Latch Guard	5000T	630	TR
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Overhead Stop	9ADJ Series (-336 or size as required)	630	RX
1	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Seal (weatherstripping)	S88D (head and jambs) by Pemko or approved equal.		
1	Ea.	Door Bottom Sweep	216A x security torx fasteners by Pemko or approved equal.		
1	Ea.	Threshold	158A offset or 171A flush condition (or per detail for flat of quarter inch offset sill detail) x wrap frame stops x beveled miter ends x mastic per specifications x by Pemko approved equal		
1	Ea.	Overhead Rain Drip	Per architectural details and flashing at uncovered areas (no water penetration; verify before submittals). For hollow metal doors, provide 346C x FFW full raindrips by Pemko or approved equal.		
1	Ea.	Door Position Switch (also known as Alarm Contact, Door Contacts)	#679-05-WD or #679-05-HM (as required per door material) by Schlage manufacturing (coordinate with Divisions 26-28 and applicable drawings).		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #05

_	Ea.	Hinges	T4A3386 x NRP (quantity and size per Section 08 71 00)	630	MC
1	Ea.	Rim-Type Exit/Panic Device (Key Override)	LD 99NL x 110NL prepared and coordinated with Z-Pull (installed facing downward, not up) for ADA key override pull	626	VO
1	Ea.	Z-Pull	#1822-3-P.630 series installed face down and templated center hole for final cylinder and rings to be installed over #1822-3-P.630 	630	TR
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Closer x Stop Arm	4050A CUSH x security torx fasteners	689	LC
1	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Seal (weatherstripping)	S88D (head and jambs) by Pemko or approved equal.		
1	Ea.	Door Bottom Sweep	216A x security torx fasteners by Pemko or approved equal.		
1	Ea.	Threshold	158A offset or 171A flush condition (or per detail for flat of quarter inch offset sill detail) x wrap frame stops x beveled miter ends x mastic per specifications x by Pemko approved equal		
1	Ea.	Overhead Rain Drip	Per architectural details and flashing at uncovered areas (no water penetration; verify before submittals). For hollow metal doors, provide 346C x FFW full raindrips by Pemko or approved equal.		
1	Ea.	Door Position Switch (also known as Alarm Contact, Door Contacts)	#679-05-WD or #679-05-HM (as required per door material) by Schlage manufacturing (coordinate with Divisions 26-28 and applicable drawings).		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

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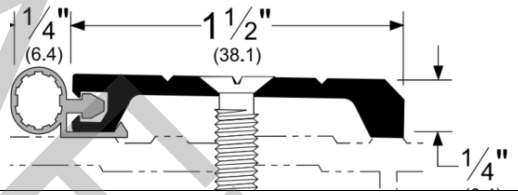
Hardware Group/Set #06

_	Ea.	Hinges	T4A3386 x NRP (quantity and size per Section 08 71 00)	630	MC
1	Ea.	Alarmed Rim-Type Exit/Panic Device (no pull-side trim)	LD ALK 99EO – alarmed 9V battery powered	626	VO
1	Ea.	Interior, Push-Side of Opening Alarm ON/OFF switch I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Closer x Stop Arm	4050A CUSH x security torx fasteners	689	LC
1	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Seal (weatherstripping)	S88D (head and jambs) by Pemko or approved equal.		
1	Ea.	Door Bottom Sweep	216A x security torx fasteners by Pemko or approved equal.		
1	Ea.	Threshold	158A offset or 171A flush condition (or per detail for flat of quarter inch offset sill detail) x wrap frame stops x beveled miter ends x mastic per specifications x by Pemko approved equal		
1	Ea.	Threshold Stop-Strip	Pemko #290ASSTP on top of the threshold so that when the door is closed against the #290ASSTP stop strip. 		
1	Ea.	Overhead Rain Drip	Per architectural details and flashing at uncovered areas (no water penetration; verify before submittals)		
1	Ea.	Door Position Switch (also known as Alarm Contact, Door Contacts)	#679-05-WD or #679-05-HM (as required per door material) by Schlage manufacturing (coordinate with Divisions 26-28 and applicable drawings).		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

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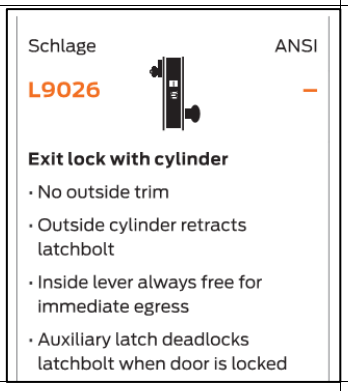
Hardware Group/Set #07

_	Ea.	Hinges	T4A3386 x NRP (quantity and size per Section 08 71 00)	630	MC
1	Ea.	Storeroom Locksets	L9026T x #06 Lever x A rose no exterior lever (key pulls door open) 	630	SC
1	Ea.	Latch Guard	5000T x through bolts x security torx screw heads	630	TR
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Overhead Stop	9ADJ Series (-336 or size as required)	630	RX
1	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Seal (weatherstripping)	S88D (head and jambs) by Pemko or approved equal.		
1	Ea.	Door Bottom Sweep	216A x security torx fasteners by Pemko or approved equal.		
1	Ea.	Threshold	158A offset or 171A flush condition (or per detail for flat of quarter inch offset sill detail) x wrap frame stops x beveled miter ends x mastic per specifications x by Pemko approved equal		
1	Ea.	Threshold Stop-Strip	Pemko #290ASSTP on top of the threshold so that when the door is closed against the #290ASSTP stop strip.		
1	Ea.	Overhead Rain Drip	Per architectural details and flashing at uncovered areas (no water penetration; verify before submittals). For hollow metal doors, provide 346C x FFW full raindrips by Pemko or approved equal.		
1	Ea.	Door Position Switch (also known as Alarm Contact, Door Contacts)	#679-05-WD or #679-05-HM (as required per door material) by Schlage manufacturing (coordinate with Divisions 26-28 and applicable drawings).		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #08

_	Ea.	Gate Hinge/Hanging Devices	Hanging device hardware by partition manufacturer		
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
Note 1: For doors/openings assigned this hardware group/set, the cylinder is for unit-type pricing. At each opening assigned this hardware group/set, provide final keying as required per locking and/or key control devices (examples include but are not limited to Coiling Door locking devices and/or control switches that activate or control the on/off switches). Note 2: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

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Interior Hardware Sets (Typically Three-Digit Set Numbers)

Hardware Group/Set #101

_	Ea.	Hinges	T4A3386 (NRP if door swing out away from room) (quantity and size per Section 08 71 00)	630	MC
1	Ea.	Electrified Transfer Hinges	T4A3386 QC8 (8-wire, size per Section 08 71 00)	630	MC
1	Ea.	Rim-Type Exit/Panic Device with Electrified Lever and Key Override	LD RX 99L x 996L-R/V x 06 Lever x security torx fasteners	626	VO
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Closer	4050A x EDA (installed push-side of door if door)	689	LC
1	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows.	630	TR
1	Ea.	Wall Stop	1270CV	626	TR
1	Ea.	Seal	S88D Perforation Feature (head and jambs) by Pemko or approved equal.		
1	Ea.	Electric Lock Power Supply	Per 08 71 00 Part 2 and security (coordinate with Divisions 26-28 and applicable plans)		
1	Ea.	Door Position Switch (also known as Alarm Contact, Door Contact)	#679-05-WD or #679-05-HM (as required per door material) by Schlage manufacturing (coordinate with Divisions 26-28 and applicable drawings).		
1	Ea.	Request-to-Exit Sensor (see free egress note in above specifications)	Parts/devices specified in above locking hardware (coordinate with Divisions 26-28 and applicable drawings).		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. - Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include card reader locations.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #102

__	Ea.	Hinges	T4A3386 (size and quantity per Section 08 71 00)	630	MC
1	Ea.	Privacy x Occupancy Indicator (exterior side lever left unlocked when room is vacant, but can be locked after hours)	L9456T x 06N x emergency cylinder/key override x #L283-722 occupancy indicator (occupied/unoccupied) x L583-363 ADA Thumbturn  	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Closer	4050A x REG (installed pull-side of door if door)	689	LC
1	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Mop Plate	KM050 6" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1270CV	626	TR
1	Ea.	Seal (sound dampening)	S88D seals (head and jambs) by Pemko or approved equal.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #103

__	Ea.	Hinges	T4A3386 (size and quantity per Section 08 71 00)	630	MC
1	Ea.	Classroom-Type Lockset	L9070T X 06N	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Closer	4050A x EDA (installed push-side of door if door)	689	LC
1	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1270CV	626	TR
1	Ea.	Seal (sound dampening)	S88D seals (head and jambs) by Pemko or approved equal.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #104

__	Ea.	Hinges	TA2314 (size and quantity per Section 08 71 00)	630	MC
1	Ea.	Classroom-Type Lockset	L9070T X 06N	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1270CV	626	TR
1	Ea.	Seal (sound dampening)	S88D seals (head and jambs) by Pemko or approved equal.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

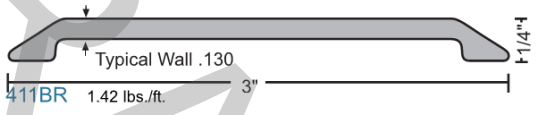
Hardware Group/Set #105

__	Ea.	Hinges	TA2314 (size and quantity per Section 08 71 00)	630	MC
1	Ea.	Office-Type Lockset	L9050 x #06N lever x L583-363 ADA Thumbturn	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1270CV	626	TR
1	Ea.	Seal (sound dampening)	S88D seals (head and jambs) by Pemko or approved equal.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #106

__	Ea.	Hinges	T4A3386 (size and quantity per Section 08 71 00)	630	MC
1	Ea.	Push Plate	1001-3-20” x custom 20” high plate (total size 4” wide x 20” tall) x BHMA 710CU (Healthy Hardware Antimicrobial)	710 CU	TR
1	Ea.	Pull Plate	1017-3 (4” x 16”) x BHMA 710CU (Healthy Hardware Antimicrobial)	710 CU	TR
1	Ea.	Closer	4050A x EDA (installed push-side of door if door)	689	LC
1	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1270CV	626	TR
1	Ea.	Seal (sound dampening)	S88D seals (head and jambs) by Pemko or approved equal.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

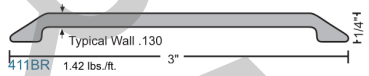
Hardware Group/Set #107

__	Ea.	Hinges	TA2314 x NRP (size and quantity per Section 08 71 00)	630	MC
1	Ea.	Storeroom-Type Lockset	L9080T X 06N	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Closer x Stop Arm	4050A CUSH	689	LC
1	Ea.	Kick Plates	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows. Provide only one push-side kickplate at doors 126A, and #124.	630	TR
1	Ea.	Seal	S88D Perforation Feature (head and jambs) by Pemko or approved equal		
1	Ea.	Auto Door Bottom (sound dampening)	411APKL or 420APKL (as required per door material or wood or hollow metal) by Pemko or approved manufacturer		
1	Ea.	Threshold (sound dampening)	411BR-DKB x RCE wrap frame stops x full bed of mastic by NGP or approved 		

Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).

Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages

Hardware Group/Set #108

_	Ea.	Hinges	TA2314 x NRP (quantity and size per Section 08 71 00)	630	MC
1	Ea.	Electrified Transfer Hinges	TA2314 QC8 (8-wire, size per Section 08 71 00)	630	MC
1	Ea.	Electrified Lockset	L9092TEU RX 06N	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Closer x Stop Arm	4050A CUSH	689	LC
1	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Seal	S88D Perforation Feature (head and jambs) by Pemko or approved equal.		
1	Ea.	Auto Door Bottom (sound dampening)	411APKL or 420APKL (as required per door material or wood or hollow metal) by Pemko or approved manufacturer.		
1	Ea.	Threshold (sound dampening)	411BR-DKB x RCE wrap frame stops x full bed of mastic by NGP or approved 		
1	Ea.	Electric Lock Power Supply	Per 08 71 00 Part 2 and security (coordinate with Divisions 26-28 and applicable plans)		
1	Ea.	Door Position Switch (also known as Alarm Contact, Door Contact)	#679-05-WD or #679-05-HM (as required per door material) by Schlage manufacturing (coordinate with Divisions 26-28 and applicable drawings).		
1	Ea.	Request-to-Exit Sensor (see free egress note in above specifications)	Parts/devices specified in above locking hardware (coordinate with Divisions 26-28 and applicable drawings).		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include card reader locations.		

Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).

Hardware Group/Set #109

_	Ea.	Hinges	T4A3386 (quantity and size per Section 08 71 00)	630	MC
1	Ea.	Electrified Transfer Hinges	T4A3386 QC8 (8-wire, size per Section 08 71 00)	630	MC
1	Ea.	Electrified Lockset	L9092TEU RX 06N	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Closer	4050A x REG (installed pull-side of door if door)	689	LC
1	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1270CV	626	TR
3	Ea.	Door Silencers	SR64 or SR65 (as required)	GR	IV
1	Ea.	Electric Lock Power Supply	Per 08 71 00 Part 2 and security (coordinate with Divisions 26-28 and applicable plans)		
1	Ea.	Door Position Switch (also known as Alarm Contact, Door Contact)	#679-05-WD or #679-05-HM (as required per door material) by Schlage manufacturing (coordinate with Divisions 26-28 and applicable drawings).		
1	Ea.	Request-to-Exit Sensor (see free egress note in above specifications)	Parts/devices specified in above locking hardware (coordinate with Divisions 26-28 and applicable drawings).		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include card reader locations.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

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Hardware Group/Set #110

_	Ea.	Swing Clear Hinge	T4A3795 5 inch or beveled edge T4A4795 5 inch as required per opening (quantity per Section 08 71 00)	652	MC
1	Ea.	Electrified Power Transfer	4612-SC (swing clear application)	626	AD
1	Ea.	Electrified Lockset	L9092TEU RX 06N	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Closer	4050A x REG (installed pull-side of door if door)	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Floor Stop	1214 x torx fasteners	626	TR
3	Ea.	Door Silencers	SR64 or SR65 (as required)	GR	IV
1	Ea.	Electric Lock Power Supply	Per Section 08 71 00 Part 2 and security (coordinate with Divisions 26-28 and applicable plans)		
1	Ea.	Door Position Switch (also known as Alarm Contact, Door Contact)	#679-05-WD or #679-05-HM (as required per door material) by Schlage manufacturing (coordinate with Divisions 26-28 and applicable drawings).		
1	Ea.	Request-to-Exit Sensor (see free egress note in above specifications)	Parts/devices specified in above locking hardware (coordinate with Divisions 26-28 and applicable drawings).		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include card reader locations.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #111

_	Ea.	Hinges	T4A3386 (quantity and size per Section 08 71 00)	630	MC
1	Ea.	Electrified Transfer Hinges	T4A3386 QC8 (8-wire, size per Section 08 71 00)	630	MC
1	Ea.	Electrified Lockset	L9092TEU RX 06N	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Closer	4050A x 180-degree parallel arm (installed push-side of door)	689	LC
1	Ea.	Concealed Closer	2215 x security torx fasteners per specifications.	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Detention Stop	420	630	SS
1	Ea.	Seal	S88D Perforation Feature (head and jambs) by Pemko or approved equal.		
1	Ea.	Electric Lock Power Supply	Per Section 08 71 00 Part 2 and security (coordinate with divisions 26-28 and applicable plans)		
1	Ea.	Door Position Switch (also known as Alarm Contact, Door Contact)	#679-05-WD or #679-05-HM (as required per door material) by Schlage manufacturing (coordinate with Divisions 26-28 and applicable drawings).		
1	Ea.	Request-to-Exit Sensor (see free egress note in above specifications)	Parts/devices specified in above locking hardware (coordinate with Divisions 26-28 and applicable drawings).		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include card reader locations.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

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Hardware Group/Set #111.1

_	Ea.	Hinges	T4A3386 x NRP (quantity and size per Section 08 71 00)	630	MC
1	Ea.	Electrified Transfer Hinges	T4A3386 QC8 (8-wire, size per Section 08 71 00)	630	MC
1	Ea.	Electrified Lockset	L9092TEU RX 06N	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Closer x Stop Arm	4050A x CUSH	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Seal	S88D Perforation Feature (head and jambs) by Pemko or approved equal.		
1	Ea.	Electric Lock Power Supply	Per 08 71 00 Part 2 and security (coordinate with Divisions 26-28 and applicable plans)		
1	Ea.	Door Position Switch (also known as Alarm Contact, Door Contact)	#679-05-WD or #679-05-HM (as required per door material) by Schlage manufacturing (coordinate with Divisions 26-28 and applicable drawings).		
1	Ea.	Request-to-Exit Sensor (see free egress note in above specifications)	Parts/devices specified in above locking hardware (coordinate with Divisions 26-28 and applicable drawings).		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include card reader locations.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

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Hardware Group/Set #112

1	Ea.	Continues Hinge	FM300 x torx	630	MA
1	Ea.	Storeroom-Type Lockset	L9080T X 06N	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows.	630	TR
1	Ea.	Detention Stop	420	630	SS
2	Ea.	Door Silencers	SR64 or SR65 (as required)	GR	IV
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #113

__	Ea.	Hinges	T4A3386 (size and quantity per Section 08 71 00)	630	MC
1	Ea.	Storeroom-Type Lockset	L9080T X 06N	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Closer x Stop Arm	4050A x CUSH	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Seal	S88D Perforation Feature (head and jambs) by Pemko or approved equal.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

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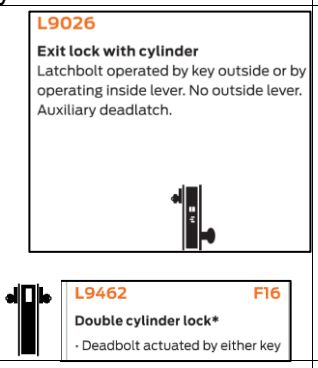
Hardware Group/Set #114

_	Ea.	Hinges	- At non-rated or non-smoke doors provide quantity of three T4A3386 hinges. - At rated or smoke doors provide quantity of one top installed TA2314 hinge and quantity of two middle and bottom installed 1552, UL listed spring hinges. - Provide 4.5” x 4.5” x security torx fasteners	630	MC
1	Ea.	Lock	Latchset/Lockset or Deadbolt: - At rated or smoke doors provide storeroom-type lockset L9026T x 06A (lever only at interior). - At non-rated or non-smoke doors provide deadbolt-type lockset L9462T  	630	SC
1	Ea.	Pull	1199-1 E-mount (do not block emergency key override)	630	TR
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Seal	S88D Perforation Feature (head and jambs) by Pemko or approved equal.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

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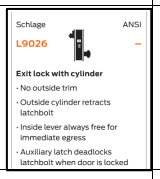
Hardware Group/Set #115

__	Ea.	Hinges	T4A3386 (size and quantity per Section 08 71 00)	630	MC
1	Ea.	Storeroom-Type Lockset	L9080T X 06N	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Closer x Stop Arm	4050A x CUSH	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Seal	S88D Perforation Feature (head and jambs) by Pemko or approved equal.		
1	Ea.	Auto Door Bottom (sound dampening)	411APKL or 420APKL (as required per door material or wood or hollow metal) by Pemko or approved manufacturer.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #116

_	Ea.	Hinges	T4A3386 x NRP (quantity and size per Section 08 71 00)	630	MC
1	Ea.	Storeroom Lockset	L9026T x #06 Lever x A rose no exterior lever (key pulls door open) 	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Detention Stop	420	630	SS
1	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
3	Ea.	Door Silencers	SR64 or SR65 (as required)	GR	IV
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

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Hardware Group/Set #117

__	Ea.	Hinges	T4A3386 x NRP (size and quantity per Section 08 71 00)	630	MC
1	Ea.	Privacy x Occupancy Indicator (exterior side lever locked at all times) 	L9485T x 06N emergency cylinder/key override x #L283-722 occupancy indicator (occupied/unoccupied) x #L583-363 ADA Thumbturn	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Concealed Closer	2215 x security torx fasteners per specifications.	689	LC
2	Ea.	Kick Plates	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1209	630	TR
3	Ea.	Door Silencers	SR64 or SR65 (as required)	GR	IV
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #118

__	Ea.	Hinges	T4A3386 (size and quantity per Section 08 71 00)	630	MC
1	Ea.	Classroom-Type Lockset	L9070T X 06N	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Concealed Closer	2215 x security torx fasteners per specifications.	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1209	630	TR
3	Ea.	Door Silencers	SR64 or SR65 (as required)	GR	IV
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages

Hardware Group/Set #119

__	Ea.	Hinges	T4A3386 (size and quantity per Section 08 71 00)	630	MC
1	Ea.	Classroom-Type Lockset	L9070T X 06N	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1209	630	TR
3	Ea.	Door Silencers	SR64 or SR65 (as required)	GR	IV
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #120

__	Ea.	Swing Clear Hinge	T4A3795 5 inch or beveled edge T4A4795 5 inch as required per opening (quantity per Section 08 71 00)	652	MC
1	Ea.	Classroom-Type Lockset	L9070T X 06N	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Overhead Stop	9ADJ Series (-336 or size as required)	630	RX
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
3	Ea.	Door Silencers	SR64 or SR65 (as required)	GR	IV
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #121

__	Ea.	Hinges	T4A3386 x NRP (size and quantity per Section 08 71 00)	630	MC
1	Ea.	Classroom-Type Lockset	L9070T X 06N	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Concealed Closer	2215 x security torx fasteners per specifications.	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Detention Stop	420	630	SS
1	Ea.	Seal	S88D Perforation Feature (head and jambs) by Pemko or approved equal.		
1	Ea.	Door Position Switch (also known as Alarm	#679-05-WD or #679-05-HM (as required per door material) by Schlage manufacturing (coordinate with Divisions 26-28 and		

		Contact, Door Contact)	applicable drawings).		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #122

__	Ea.	Hinges	T4A3386 (size and quantity per Section 08 71 00)	630	MC
1	Ea.	Institutional Double Keyed Lockset	L9082T X 06N	630	SC
2	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
2	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Concealed Closer	2215 x security torx fasteners per specifications.	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1209	630	TR
3	Ea.	Door Silencers	SR64 or SR65 (as required)	GR	IV
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #123

__	Ea.	Hinges	T4A3386 (size and quantity per Section 08 71 00)	630	MC
1	Ea.	Institutional Double Keyed Lockset	L9082T X 06N	630	SC
2	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
2	Ea.	Permanent Core	20-740	626	SC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1209	630	TR
3	Ea.	Door Silencers	SR64 or SR65 (as required)	GR	IV
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

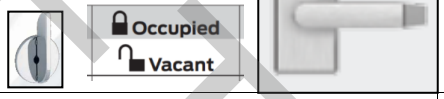
Hardware Group/Set #124

Note 1: All hardware supplied by door or opening manufacturers (no Section 08 71 00 scope).
Note 2: Furnish all devices and components for openings assigned this hardware groups/set in accordance with Contract Documents (requirements in project manual and architectural plans).

Hardware Group/Set #125

__	Ea.	Hinges	T4A3386 (size and quantity per Section 08 71 00)	630	MC
1	Ea.	Privacy x Occupancy Indicator (exterior side lever locked at all times) 	L9485T x 06N emergency cylinder/key override x #L283-722 occupancy indicator (occupied/unoccupied) x #L583-363 ADA Thumbturn	630	SC
1	Ea.	Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Closer x Stop Arm	4050A x CUSH	689	LC
2	Ea.	Kick Plates	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Seal	S88D Perforation Feature (head and jambs) by Pemko or approved equal.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #126

__	Ea.	Hinges	T4A3386 (size and quantity per Section 08 71 00)	630	MC
1	Ea.	Privacy x Occupancy Indicator (exterior side lever left unlocked when room is vacant)	L9444 x #06N x emergency cointurn/slot override x #L283-722 occupancy indicator (occupied/unoccupied) x L583-363 ADA Thumbturn  	630	SC
1	Ea.	Closer	4050A x REG (installed pull-side of door if door)	689	LC
1	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Mop Plate	KM050 6" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1270CV	626	TR
1	Ea.	Seal (sound dampening)	S88D seals (head and jambs) by Pemko or approved equal.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

END OF SECTION

SECTION 08 71 13

AUTOMATIC DOOR OPERATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. BHMA electrified, swinging door automatic operator devices.

B. Accessories including but not limited to actuating controls and safety sensors at designated doors.

1.2 PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS SECTION

A. Hardware templates for doors and frames.

1.3 RELATED SECTIONS LIONAKIS

A. Section 07 92 00 – Joint Sealants.

B. Section 08 41 13 – Aluminum Framed Entrances and Storefronts.

C. Section 08 71 00 – Door Hardware.

D. Divisions 26 through 28: Electrical rough in, wiring and connectors for electrified hardware including, but not limited to:

1. Wire and connectivity from ceiling through frame to electrified hardware devices including non-Section 08 71 00 task of providing wiring inside of doors.
2. Automatic Door Operators e-power or emergency power connectivity scope: At non-fire and non-smoke rated openings that have auto operators provide emergency power backup.

1.4 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only.

1. Refer to Architect's Division 01 for definitions, acronyms, and abbreviations.
2. Unless otherwise noted; standards, manuals, and codes refer to the latest edition as of the issue date of this Project Manual.

B. Conform to the following Referenced Standards and Requirements:

1. CBC – 2022 California Building Code, including CBC Section 11B-404.3.
2. ADA – Americans with Disabilities Act - 2010 Standards for Accessible Design.
3. AAADM – American Association of Automatic Door Manufacturers.
4. NFPA 80-16 – Standard for Fire Doors and other Opening Protectives.
5. NFPA 101-18 – Life Safety Code.
6. ANSI/BHMA 156.19 American National Standard for power high and low energy operated doors.
7. ANSI A156 Series – Builders Hardware Manufacturers Association (BHMA) Standards.

1.5 COORDINATION

A. Coordinate work of this Section with Sections involving manufacturer of internal reinforcement for doors, frames, and hardware.

1. Coordinate work in this Section with work in related Sections.

2. This Section's hardware sets/groups as specified in Part 3 are intended to establish type and design standard when used together with the requirements of specifications, drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections. Where hardware sets/groups have different information than the specifications refer to the specifications and drawings for clarification and bid combined hardware sets/groups and Contract Documents/specifications (provide combined materials/devices at time of submittals).

B. Provide hardware templates to door and frame manufacturer. Provide two templates to those manufacturers who are not currently registered template book holders. Contractor shall be responsible for verifying that the door hardware accepted for installation is compatible for use with the doors and door frames.

C. Coordinate keying requirements as specified in Section 08 71 00 "Door Hardware".

D. Convene coordination meeting between all opening vendors and installers at least two weeks prior to purchasing doors, frames, door hardware and electrical devices required for complete systems.

1. Required attendance includes but is not limited to the following: Contractor; hardware supplier and/or installer; door supplier and/or installer; frame supplier and/or installer; auto operator vendor and/or installer; security card reader vendor and/or installer; and electrical.

2. Contractor shall be responsible for verifying that the door hardware accepted for installation is compatible for use with the doors and door-frames.

3. For card reader interface with applicable door devices, security vendor and/or installer (coordinate accordingly) to have a written agenda and plan on how scope related to electrified devices will be installed to have a complete wired and operational card access system. The card reader interface scope includes but is not limited to card reader inputs and output coordination on the electric locking device power supply, electric locking devices and connectivity as well as confirmation of a complete, wired and operational card access system. Provide all required relays and devices as part of the overall system in accordance system requirements at no additional cost to Owner.

4. For auto operator interface with applicable door devices, auto operator vendor and/or installer (coordinate accordingly) to have a written agenda and plan on how scope related to electrified devices will be installed to have a complete wired and operational auto operator system. The auto operator interface scope includes but is not limited to connectivity and inputs for push-plates, BEA BR3 (or approved equal required auto operator relays), electric locking devices, as well as confirmation of the complete, wired and operational auto operator system. Provide all required relays and devices as part of the overall system in accordance system requirements at no additional cost to Owner.

5. Vendor and/or installer (coordinate accordingly) not responsible for electrical-power (see electrical drawings) or FLS (fire/life safety) connectivity to above frame or back-of-house power supply (back-of-house meaning remote low voltage power). FLS connectivity only required for fire or smoke rated opening in particular functions to meet code as scheduled.

E. Examine Contract Documents and furnish proper hardware for door openings. Example includes, but is not limited to system integration:

1. Provide electrical interface control capability for card reader or keypad operation of swinging automatic entrances on doors with electric locking. Integrate swinging automatic entrances with other systems as required for a complete working installation.
2. Where required for proper operation, provide a time delay relay to signal automatic door operator to activate only after electric lock system is released.
3. Electrical System Roughing-in: Coordinate layout and installation of swinging automatic entrances with connections to, power supplies and remote activation devices. Review details and conditions prior to ordering material.

1.6 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Pre-Hardware Schedule:

1. Report all prevailing conditions that will adversely affect satisfactory execution of work.

C. Submit a detailed door and hardware schedule according to the following:

1. Hardware Schedule:
   a. Submit hard copies of hardware schedule (number of copies per Division 01) as well as submit editable, PDF files via electronic email of ftp site process in vertical format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Schedules which do not comply will be returned for correction before checking. Horizontal-type schedules will be returned for correction before checking.
   b. Hardware schedule shall clearly indicate each hardware group specified and manufacturer of each item proposed.
2. Provide two copies of illustrations from manufacturer’s catalogs and data in brochure form.
3. Wiring Information: Provide manufacturers’ wiring information including manufacturers’ door elevation diagrams for electrified hardware based on Door Hardware Institute (DHI) core class “Electrified Architectural Hardware” DHI class #COR133. Openings where only magnetic hold-opens or door position switches are specified do not require wiring information. Provide information with hardware schedule submittal for review. Provide detailed wiring diagrams with hardware delivery to jobsite.
4. Review of schedules does not relieve the Contractor of providing all hardware required for the Work, whether or not such hardware was inadvertently omitted from Submittal.

D. Templates:

1. Provide listing of manufacturer's template numbers for each item of hardware in hardware schedule.
2. Submit templates and "Reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.

E. Installation Instructions:

1. Provide manufacturer's written installation and adjustment instructions for finish hardware.
2. Send installation instructions to site with hardware.

F. Contract Closeout Submittals (include specific requirements indicated):

1. Operating and maintenance manuals.
   a. Complete information in care, maintenance, and adjustment, data on repair and replacement parts, and information on preservation of finishes.
   b. Catalog pages for each product.
   c. Name, address, and phone number of local representative for each manufacturer.
   d. Parts list for each product.
   e. Copy of final accepted hardware schedule, edited to reflect "As installed".
2. Copy of final keying schedule.
3. Maintenance data and devices:
   a. Submit two copies of operator maintenance manuals that include the following items:
      1) Lubrication instructions.
      2) Operator maintenance instructions.
   b. Provide special wrenches and tools applicable to each different or special component.
   c. Provide maintenance tools and accessories supplied by manufacturer.

1.7 QUALITY ASSURANCE

A. Operator Device Supplier Qualifications: Firm specializing in the supply and servicing of institutional and commercial low energy operator devices and sliding automatic doors; accredited by manufacturers; and having a minimum of three years documented experience. Hardware supplier to furnish list of at least ten completed projects complete with date competed, project location and project contact information.

B. Manufacturer Qualifications and Documentation:

1. Operator Device Manufacturer Qualifications: Manufacturer specializing in manufacturing institutional and commercial high and low energy operator devices with a minimum five years with the following documented experience. Furnish list of at least ten projects (past, finished projects). Include date competed, project location and references (past project contact information to determine if commercial high and low energy operator devices are acceptable).
2. Manufactured devices submitted must have a factory certified central dispatch service for warranty. System to be available 24 hours a day, 365 days per year to obtain malfunction information and dispatch appropriate service agency to the customer location.

C. Installer Qualifications and Documentation:

1. Company specializing in installing the products specified in this Section shall have minimum ten years' experience and be a member of the American Association of Automatic Door Manufacturers (AAADM). A completed AAADM compliance form shall be submitted as proof of compliance with current ANSI/BHMA 156.19 American National Standard for power high and low energy operated doors as well as high energy operators. Doors shall be inspected and form shall be signed by an AAADM certified inspector prior to placing doors in operation.
2. Operator Device Installer qualifications: The installer of assembly shall be trained in the trade of installing and start-up of commercial high or low energy operator devices and sliding automatic doors. Supplier and Installer of door assemblies shall be authorized representative of manufacturers and have minimum of five years successful experience in detailing, supplying and installing commercial high and low energy operator devices and sliding automatic doors specified on projects of similar size, complexity and type to this Project.
3. Local certified distributor to install operator in accordance with current ANSI/BHMA 156.19 American National Standard for High and Low Energy Power Operated Doors and local applicable codes. For low energy applications, local certified distributor to install operator in accordance with ANSI 156.19, ANSI 117.1, NFPA 101-18 and local applicable codes.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Storage: Store materials in a cool and dry location, elevated from the ground and protected from the elements, and secured from theft or pilferage.

1.9 WARRANTY

A. Comply with provisions of Division 01.

B. Unless otherwise specified below, furnish to Owner a written manufacturer's two year extended guarantee for automatic door operators against defects in materials and workmanship.

PART 2 PRODUCTS

2.1 MATERIALS: GENERAL REQUIREMENTS

A. The Specifications are intended to cover all doors in the Project and establish a type and standard of quality, but it is the responsibility of the Contractor to furnish proper hardware for all openings and for a complete installation. Where Hardware Groups/Sets have different information refer to the following specifications for clarification and detailed requirements (provide all devices whether specified or not in hardware sets/groups).

2.2 FINISHES

A. Typical BHMA finish designation references (provide hardware groups/sets devices/finishes, along with added finishes below, as indicated on drawings and detailed requirements for each type of device):

1. BHMA 313 - Aluminum, dark anodized.
2. BHMA 626 - Satin chromium plated brass or bronze.
3. BHMA 628 - Aluminum, clear anodized.
4. BHMA 630 - Satin stainless steel.
5. BHMA 689 - Sprayed aluminum paint finish.

2.3 HARDWARE TEMPLATE

A. Promptly furnish template information or templates to door and frame manufacturers.

B. Coordinate hardware items to prevent interference with each other.

2.4 FASTENINGS

A. Fastenings shall match hardware material and finish.

B. Use screws, bolts, washers, grommets, nuts, and other fastening devices of appropriate size, length, type, head, metal and finish as necessary for proper match and application of hardware Machine screws and tamping shields for attaching hardware to concrete, stone, or masonry.

C. Provide nonferrous or corrosion-resistant steel fasteners exposed to weather.

2.5 SUBSTITUTIONS

A. Some products listed in this Section by brand name and model number have been established by the Owner as standard. No substitutions permitted for those products.

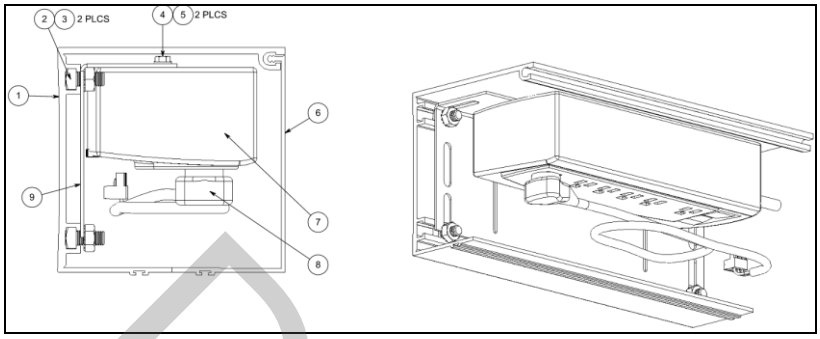
1. Otherwise refer to Division 01 for substitutions.

2.6 LOW ENERGY AUTOMATIC OPERATOR DEVICES

A. Overhead surface or concealed mounted devices:

1. Furnish and install UL rated 4900LE low energy operators by Horton manufacturing. (4000LE series is acceptable at #1) non-fire or non-smoke rated opens and #2) UL smoke and fire rating openings if information is attached to show 4000LE device and factory 8-1/2 inch x 11 inch UL listed information is part of the submittal and site work process.

2. Horton 4900LE/4000LE series with as schedule in Section 08 17 13, Part 3 below with complete Cyberpower #DS CP425SLG Battery Backup. Provide per part #s in snippet below. Note: Cyberpower to be internal for 6 inch x 6 inch surface applied devices and in ceiling above Cyberpower wired to concealed units and engineered by Section 08 71 13 Vendor for each condition.



Horton AUTOMATICS
4242 Baldwin Boulevard
Corpus Christi, Texas 78405
(800)531-3111
FACTOR:
MULTIPLIER:
PART NO. J2014.00 S3of4

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	C02909.001AB	EXTRU; BACKMEMBER W/WS NOSING	1
2	C04146.0000	BOLT; 3/8-16 X 3/4" SQHMB	4
3	C05702.0000	NUT; #3/8-16 HEX KEPS	4
4	C00080.0001	NUT, HEX, SERRATED FLANGE, 8-32	2
5	C10047.0000	WELD STUD #8-32 X 1/2" STL	2
6	C02908.001AB	EXTRU; FACEPLATE W/WS NOSING	1
7	C10037.0000	UPS BOX, TRIPPLITE 300	1
8	C10042.0000	ASSEMBLY; POWER CORD	1
9	C10041.0000	BRACKET, BBU MOUNT	1

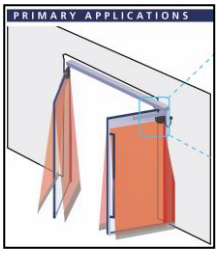
3. Approved manufacturers and devices if operator could #1) open door closed against room air pressure differences; #2) open/close 400 pound door (whether or not doors on this project are 400+ pounds) #3) all specified criteria must be met in full. (all components required to complete the work in accordance with specifications and intended operation including battery backup system to meet CBC 2022), then the following manufactures and devices will be considered for approval utilizing Contract Documents substitution process. Note: Cyberpower externally mounted will be approved if engineered by Section 08 71 13 vendor's engineering group prior to submittals.
   a. ED250 x battery backup system by Dorma Manufacturing.
   b. Condor Series x battery backup system by Motion Access Manufacturing.
   c. Magic Series x battery backup system by Stanley Manufacturing.
   d. SW200i x battery backup system by Besam Manufacturing.

B. Contract directly with member of the American Association of Automatic Door Manufacturers (AAADM, not as a sub-contract to the door supplier).
   1. Example Contact 1: Capitol Door Service:
      a. Northern California http://www.capitoldoors.com/cb-nc-home.htm (800) 783-1163.
      b. Southern California http://www.capitoldoors.com/cb-nc-home.htm (909) 484-3401.
   2. Example Contact 2: Stanley Magic:
      a. Northern California: Corey Welsh (Corey.welch@sbdinc.com).
      b. Northern California: Magic John A. Santos 818-770-6165.
   3. Example Contact 3: Erik Huber - Operations Manager Southern California / Southern Nevada:
      Pedestrian Door Solutions, ASSA ABLOY Entrance Systems, 1520 S. Sinclair Street, Anaheim, Direct: (714) 922-9925.

4. Example Contact 4: Automatic Door Systems, Inc. www.autodoorinc.com / 800.592.8282. Kevin Regan.
5. Example Contact 5: Automated Services and Products, Inc. http://www.asapdoors.com (510) 658-2727.
6. Example Contact 6: Paradise Door Sales, 844.978.7372

C. Where Hardware Groups/Sets have different information refer to the following specifications for clarification and detailed requirements:

1. Drop Plates, Brackets or Adapters (see snippet below with filler plate example):
   a. Provide complete drop plates / brackets as required to suit details.
   b. Do not install auto operators with space remaining between the wall and auto operator body. Provide non-ferrous, galvanized metal shims and/or metal space blocking between auto operator body and wall conditions.
   c. Finished surface and edges of backer plates shall be smooth and dry Backer rods and finish sealants are only allowed where primer and paint can be applied so that daily cleaners can be utilized to clean surfaces without cleaners stripping sealants and/or paints.
2. Provide required relays and devices as part of the overall system in accordance system requirements. Units shall have relay contact for interfacing products. Door operator shall have input line rating of 120 VAC. Unit shall have an internal circuit breaker switch to interrupt input power for servicing. Unit shall be U.L. Listed for automatic closing door. Unit shall be in compliance with the requirements of the Americans with Disabilities Act (ADA) and ANSI standards A117.1 and A156.19.
3. Provide adjustment for opening, closing, and checking speeds, as well as length of time door remains open.
4. Relays, timer, and logic modules devices: At all auto door operator locations, provide BEA device # BR3 relay, timer, and logic modules (required for interface to indicated security components; and shall be assembled, connected, and fully contained within the power supply enclosure).
5. Relays, timer, and logic modules devices:
   a. At all auto door operators locations, provide BEA device # BR3 relay, timer, and logic modules (required for interface to indicated security components; and shall be assembled, connected, and fully contained within the power supply enclosure).
6. Safety Sensor Devices:
   a. Design basis of design: BEA manufacturing #10LZRFLATSCAN-SWB x required relays. Safety sensor devices installed on door as shown below (provide installation back plates and devices as required for each type of door/frame condition):



   b. At specified low energy operator locations in hardware sets below, provide one safety sensor device at each leaf.
      1) Safety sensor devices are not to be utilized for opening sensors. Opening actuation by wall mounted push plates or separate infrared presence sensor as scheduled.
      2) Sensor devices are to be active infrared presence/safety sensor. The function of device is to protect the door from closing on a person or object in the swing-area detection zone.

c. Provide additional lockout module devices as required as some of the newer auto operator device manufacturers have a built-in lockout. Provide a fully functional system to meet design intent. Lockout module is typically determined by the door controller/control box.

D. Push Plates and Touch-Activated Automatic Door Controls:

1. Provide Automatic Operators devices with external Actuators. Card readers also to be utilized at exterior doors where indicated in drawings and as scheduled. Push-and-Go type features are not acceptable.
2. Bollards: See as scheduled below in hardware group/sets.
3. Touch-Activated Push-Plates (also known as actuator devices), acceptable manufacturers and products: Wikk Industries, Inc., Greendale, WI, 877-421-9490: “INGRESS’R” device as scheduled, or equal with wheelchair logo and added text “PUSH TO OPEN”. Switches mounted outdoors or exposed to interior water/humidity shall be mounted with weather resistant integral rubber gasket and bock box, supplied by the same manufacturer (provide weather resistant devices that have no gaps for water or ice to penetrate).
4. Where Hardware Groups/Sets have different information refer to the following specifications for clarification and detailed requirements:
   a. Furnish and install touch-activated automatic door controls with Micro-Switches: double pull, double throw, dry-contact, momentary-action micro-switch.
   b. Furnish and install touch -activated automatic door controls in Type 304 stainless steel finishes with international symbol of accessibility and lettering “push to open” engraved and applied in permanent blue enamel.
   c. Mounting: flush-type compatible with touch-activated automatic door controls. Provide complete installation brackets or adapters for automatic operator actuators to suit application.
5. External Switches:
   a. Switch installed on above frame, external auto operator body:
      1) Low energy operator manufacturer to have keyed rocker as part of overall system and installed on auto operator external body above frame.
      2) Electrified ON/OFF single gang application: #Wikk manufacturing model #KSM2P-OOH, or equal.

2.7 POWER SUPPLIES

A. Where Hardware Groups/Sets have different information (number of wires and missing power supply devices and information), refer to the following for clarification and submit according to complete and intended electrified system.

1. Coordinate use of power supplies with door and frame locations. Provide power supplies, relays and battery backup units as part of the overall system in accordance with the manufacturer’s warranty and system requirements.
2. Output shall be filtered and regulated. Relay, timer, and logic modules shall be provided as required for interface to indicated security components; and shall be assembled, connected, and fully contained within the power supply enclosure.
3. Provide required connections to fire alarm/life safety system and for remote site activation of all electrified components and functions.

PART 3 EXECUTION

3.1 EXAMINATION

A. The operator installer shall examine the areas and conditions under which the automatic operators are to be installed, and notify the Architect in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until satisfactory conditions have been corrected.

B. Measurements: Verify all dimensions by taking field measurements before any material is fabricated and shipped to the job site.

3.2 INSTALLATION

A. Install all devices in accordance with manufacturer's printed instructions and approved shop drawings. Install all devices level and plumb.

B. Projecting Items: Install or re-install wrappings furnished by the manufacturer.

C. Coordinate operator installation with electrical connection requirements.

D. Sealants: Furnish and install all sealants indicated or required to complete installation per Section 07 92 00.

E. Install equipment per current ANSI/BHMA A156.19 American National Standard for Power Assist and Low Energy Power Operated Doors and as directed by American Association of Automatic Door Manufacturers (AAADM) recommendations.

F. Push plates and touch-activated automatic door controls:

1. Install touch-activated automatic door controls at mounting height 3 inches above finished floor or as indicated on the Drawings.

2. Mount touch-activated automatic door controls securely in place to supports with fasteners supplied by manufacturer.

3.3 TESTING, ADJUSTING AND INSPECTION

A. Repair or replace installations which do not perform according to manufacturer's printed instructions and approved shop drawings.

B. Adjust parts for smooth, uniform operation. Lubricate moving parts with manufacturer recommended lubricant. Replace units that cannot be adjusted and lubricated to operate freely and smoothly as intended for the application.

C. Adjust door closer devices (inner unit within Auto Operator devices):

1. Adjust closer delay and operating speeds to comply with requirements of CBC and Chapter 11B, Part 2, Title 24 CCR and the Americans with Disabilities Act Architectural Guidelines, Article 4.13.10.

2. Door closers shall have sweep period adjusted so that from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum per 2022 CBC Chapter 11B, Section 404.2.8.1.

3.4 CLEANING

A. After repeated operation of completed installation, readjust door operators and controls for smooth, quiet and optimum operating condition and safety. Clean surfaces promptly after installation. Provide protective treatment and other precautions required through the remainder of the construction period to ensure that automatic operators will be without damage or deterioration.

B. Defective Work: Remove and replace any defective work that cannot be properly repaired, cleaned or touched up.

C. Just prior to final acceptance of building or as directed, remove protective paper coverings and clean and polish hardware.

3.5 HARDWARE GROUP/SETS

A. Manufacturer Abbreviations:

Manufacturer	Abbreviation
BEA Manufacturing	BEA
Wikk Manufacturing	WIK
Horton Manufacturing	HOR
Optex	OPT

B. The “Request-to-Exit” feature as described below is a security feature that announces/tells the security system if occupant is leaving the building interior area and similar to a motion-sensor the “Request-to-Exit” switch or device does not affect egress of the doors. Unless noted, all doors in hardware group/sets are free egress at all times with no special knowledge to exit.

C. Hardware Columns - Example (Legend):

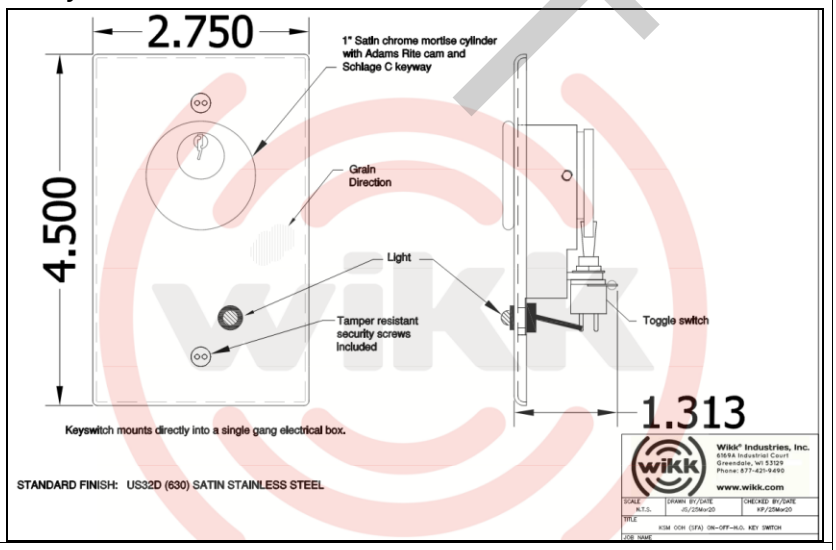
Qty	Device Description	Device # (include specification language)	Finish	Manu
1	- - - - - - - - - - - -	- - - - - - - - - - - -	- - - -	

D. The following hardware sets are intended to establish type and standard of quality when used together with the requirements of this Section. See above Section and related Sections including Division 01.

1. Examine Contract Documents and furnish proper hardware for door openings.
2. Refer to Door Schedule on the Drawings for Hardware Group/Set assignments for each opening.

Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages

For doors assigned Hardware Groups/Sets #01 on door schedule, provide the following:

Note 1: In addition to the devices specified in hardware group/set below, also coordinate devices in specification Section 08 71 00 “Door Hardware”. Furnish and install doors, frames and related scope per complete Contract Documents.			
1	Ea.	Surface Overhead Low Energy Operator System	Per Section 08 71 13 and the following: Horton push-side 4000LE with concealed battery backup or approved equal: - Clear Anodized finish (arms and mounting plates included in matching finishes). Note: means and methods – devices to match aluminum framing at all times, if aluminum framing changes in submittal or shop drawing process Contractor to update finish of auto operator covers, arms and body to match curtainwall or aluminum framing. - Provide installation plates, arms and covers as required per conditions including, but not limited to deeper frame conditions/reveal and/or hanging devices (hinge as specified in Section 08 71 00). Show deeper frame conditions/reveal and/or hanging devices in shop drawings during submittals.
1	Ea.	Safety Sensor	BEA manufacturing #10LZRFLATSCAN series per above specification x required relays x installation brackets and only push side (no pull-side safety sensors)
2	Ea.	Automatic Door Actuators (also known as Wall Push-Plates)	At both interior and exterior (both flush mounted to wall), furnish and install Wikk manufacturing #Ingress'r model #I36: brushed satin stainless steel x hardwired x double pull, double throw, dry-contact, momentary-action micro-switch, with blue wheelchair logo and text “PUSH TO OPEN”
1	Ea.	Wall Mount, Single-Gang Box “On/Off two-way switch”	#Wikk manufacturing model #KSM2N-OOH. Note: The model #KSM2N-OOH is to be installed at the interior of the building just above the interior Ingress’r and be wired in order to turn off only the exterior push plate. The interior push plate is always active. 
1	Ea.	Above frame On/Off two-way switch on operator body	On/Off two-way switch per specifications. Coordinate with auto operator manufacturer to verify correct keyed rocker switch size and type for operators installed.
1	Ea.	Relay Device,	Provide BEA BR3, 10-BR3 or approved equal relay device:

		Various inputs and outputs interface task (required connectivity and required wires)	operator vendor/installer to interface all inputs and outputs on the power supply (interfaces to all applicable devices). Operator vendor/installer to interface all inputs and outputs including, but not limited to, power supplies and BR3-type devices to all other inputs and output devices.
1	Ea.	Coordination task for electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By electrical as required per Contract Documents. Coordinate with electrical Divisions 26 and 28 and applicable drawings
Note 2: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents including, but not limited to, additional hardware devices requirements in the above specification language, architectural plans, and full specification documents.			

END OF SECTION

SECTION 08 81 00

GLASS GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glass and glazing for windows and doors.

1.2 RELATED SECTIONS

A. Section 07 92 00 – Joint Sealants: Sealant and back-up material.

B. Section 08 11 13 – Hollow Metal Doors and Frames: Glazed doors.

C. Section 08 14 00 – Wood Doors: Glazed doors.

D. Section 08 41 13 – Aluminum Framed Entrances and Storefronts.

E. Section 08 88 13 – Fire Rated Glazing.

F. Section 11 98 15 – Detention Security Glazing.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. American National Standards Institute (ANSI) – ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings.
2. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
3. ASTM C1036 – Standard Specification for Flat Glass.
4. ASTM C1048 – Standard Specification for Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.
5. ASTM C1376 – Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
6. ASTM E546 – Standard Test Method for Frost Point of Sealed Insulating Glass Units.
7. ASTM E576 – Standard Test Method for Frost Point of Sealed Insulating Glass Units in the Vertical Position.
8. ASTM E1300 – Standard Practice for Determining Load Resistance of Glass in Buildings.
9. ASTM E2190 – Standard Specification for Insulating Glass Unit Performance and Evaluation.

10. Consumer Product Safety Commission (CPSC) – CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials.
11. GANA Glazing Manual.
12. GANA Sealant Manual.
13. IGMA North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use.
14. NFRC 100 – Procedure for Determining Fenestration Product U-Factors.
15. NFRC 200 – Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
16. NFRC 300 – Standard Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.
17. SGCC – Safety Glazing Certification Council – Certified Products Directory.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data on Glass Types Specified: Provide structural, physical and environmental characteristics, size limitations, and special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, and special handling or installation requirements. Identify available colors.

D. Submit documentation indicating that all tempered glazing to be installed on this project is certified by the Safety Glazing Certification Council.

E. Samples:

1. Glass: Submit two samples, 12 inches x 12 inches in size, illustrating each type of glazing.
2. Glazing Sealant: Submit 3 inch long bead of glazing sealant, color as selected by Architect.

1.5 PERFORMANCE / DESIGN CRITERIA

A. Glass Strength: Analysis shall comply with ASTM E1300, Determining Load Resistance of Glass in Buildings. Provide glass products in the thickness and strengths (annealed or heat treated) required to meet or exceed the following criteria based on project loads and in-service conditions.

1. Minimum thickness of annealed or heat-treated glass products to be selected so the worst case probability of failure does not exceed the following:
   a. Eight breaks per thousand for glass installed vertically or not fifteen degrees or more from the vertical plane and under wind action.
   b. One break per thousand for glass installed fifteen degrees or more from the vertical plane and under action of wind and/or snow.
2. Deflection must be limited to prevent disengagement from the frame and be less than or equal to 3/4 inch or L/175.

B. Thermal and Optical Performance: Provide glass products with performance properties specified in this Section. Performance properties shall be manufacturer's published data as determined according to the following procedures:

1. Center of glass U-Value: NFRC 100 methodology using LBNL WINDOW 5.2 computer program.
2. Center of glass solar heat gain coefficient: NFRC 200 methodology using LBNL-35298 WINDOW 5.2 computer program.
3. Solar optical properties: NFRC 300.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual, IGMA North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use, and GANA Sealant Manual for glazing installation methods.

B. Installer's Qualifications: The installation shall be performed only by an installation firm normally engaged in this business. All work shall be performed by qualified mechanics that specialize in glazing and glass installation.

C. Safety glazing shall meet the requirements of 2022 CBC Section 2406 and shall be identified in accordance with 2022 CBC Sections 2403.1 and 2406.3, with identification etched in glass.

D. Glass installation in frames shall comply with the Minimum Glazing Requirements in CBC Table 2403.2.1.

1.7 JOB AND ENVIRONMENTAL CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 48 hours after installation of glazing compounds.

1.8 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop Drawings.

1.9 COORDINATION

A. Coordinate Work with glazing frames, wall openings, and adjacent Work.

1.10 WARRANTY

A. Provide five year limited warranty from date of manufacture for insulating units that are glazed in accordance with manufacturer's glazing instructions.

PART 2 PRODUCTS

2.1 GENERAL

A. All glass shall be graded and meet requirements of ASTM C1036 and ASTM C1048, Type 1, quality q3. Each light of glass delivered and installed shall have affixed thereto the manufacturer's grade label.

B. All Low-E coated glass shall have a permanent marking affixed at the spacer identifying the coated surface.

C. Glazing material installed in Hazardous Locations subject to human impact shall be certified and permanently labeled as meeting applicable requirements referenced in NFPA 80 and 2022 CBC Section 2406.

1. CPSC 16 CFR 1201, Category I and II.

2.2 GLASS TYPES

A. TYPE G-1: Low-E Insulating Glass:

1. Acceptable Manufacturers:

a. Vitro Architectural Glass. Product: Solarban 70 (2) + Clear.

b. Oldcastle Glass.

c. Viracon.

d. Guardian.

e. Substitutions: Under provisions of Division 01.

2. Material: 1 inch thick hermetically sealed assembly consisting of 1/4 inch thick Low-E clear glass on the outboard surface (coating on the #2 surface), 1/2 inch air space and 1/4 inch thick clear glass on the inboard surface with a Winter Daytime U-value of 0.28 or less, Solar Heat Gain Coefficient (SHGC) of 0.27 or less, and Visible Light Transmittance of 64 percent. Glass shall be heat strengthened; tempered where required by CBC and where indicated on Drawings.

B. TYPE G-2: Float Glass:

1. Acceptable Manufacturers:

a. Vitro Architectural Glass, a Division of PPG Industries.

b. Oldcastle Glass.

c. Viracon.

d. Guardian.

e. Substitutions: Under provisions of Division 01.

2. Material: 1/2 inch thick clear tempered glass.

C. TYPE G-3: Float Glass:

1. Acceptable Manufacturers:

a. Vitro Architectural Glass, a Division of PPG Industries.

b. Oldcastle Glass.

c. Viracon.

d. Guardian.

e. Substitutions: Under provisions of Division 01.

2. Material: 1/4 inch thick clear tempered glass.

2.3 GLAZING SEALANT

A. Glazing Sealants: ASTM C920, Type S, Grade NS, Uses “G” and “A”. Dow Corning 795, Tremco "Proglaze" or GE Silicone Sealants; Tremco "Mono" acrylic sealant or accepted equal. All sealants shall be compatible with the type of glazing and window frame to which they are applied.

1. Sealants shall comply with regulations of South Coast Air Quality Management District Rule 1168 for VOCs.

2.4 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene EPDM blocks with a Shore A durometer hardness of 85, ±5 percent, chemically compatible with sealant used.

B. Spacer Shims: Neoprene, 50-60 Shore A durometer hardness, minimum 3 inches long by one half the height of the glazing stop by thickness to suit application.

C. Glazing Tape: 100 percent solids by weight, highly adhesive and elastic, cross-linked butyl rubber preformed tape with a continuous integral EPDM shim; 57 Shore 00 durometer hardness; black color; Tremco POLYshim II Tape or accepted equal.

D. Glazing Splines: Resilient polyvinyl chloride extruded shape to suit glazing channel retaining slot; black color.

E. Miscellaneous: Furnish all primers-sealers, setting blocks, shims, spacers, compression seals, etc., as required for a first class workmanlike job.

2.5 FABRICATION

A. Flat Glass:

1. Comply with ASTM C1036 Standard Specification for Flat Glass, Type 1, Class 1 (clear) or Class 2 (tinted, heat-absorbing and light reducing) and Quality q3.
2. ASTM C1048 Heat Treated Flat Glass, Kind HS or FT, Condition A (uncoated), or C (other coated glass).
    a. Heat Treated Flat Glass to be by horizontal (roller hearth) process with inherent rollerwave distortion parallel to the bottom edge of the glass as installed.
    b. Maximum peak to valley rollerwave 0.003 inch in the central area and 0.008 inch within 10.5 inches of the leading and trailing edge.
    c. Maximum bow and warp 1/32 inch per lineal foot.
    d. All tempered architectural safety glass shall conform to ANSI Z97.1 and CPSC 16 CFR 1201.
    e. For all fully tempered glass, provide heat soak testing conforming to EN14179 which includes a two hour dwell at 290 degrees C, ±10 degrees C.

B. Insulating Glass:

1. Comply with ASTM E2190 Standard Specification for Insulating Glass Unit Performance and Evaluation.
    a. Units shall be certified for compliance by the IGCC in accordance with the above ASTM test method.
2. The unit overall thickness tolerance shall be -1/16 inch / +1/32 inch.

3. Comply with ASTM E546 Standard Test Method for Frost Point of Sealed Insulating Glass Units.
4. Comply with ASTM E576 Standard Test Method for Frost Point of Sealed Insulating Glass Units in the Vertical Position.
5. Sealed Insulating Glass Units to be double sealed with a primary seal of black polyisobutylene and a secondary seal of silicone.
    a. The minimum thickness of the secondary seal shall be 1/16 inch.
    b. The target width of the primary seal shall be 5/32 inch.
    c. There shall be no voids or skips in the primary seal.
    d. Up to a maximum of 3/32 inch of the airspacer may be visible above the primary polyisobutylene sealant.
    e. Gaps or skips between primary and secondary sealant are permitted to a maximum width of 1/16 inch by maximum length of 2 inches with gaps separated by at least 18 inches. Continuous contact between the primary seal and the secondary seal is desired.
6. Provide a hermetically sealed and dehydrated space. Lites shall be separated by an aluminum spacer with three bent corners and one keyed-soldered corner or four bent corners and one straight butyl injected zinc plated steel straight key joint.

C. Coated Vision Glass:
1. Comply with ASTM C1376 Standard for Pyrolytic and Vacuum Deposition Coatings on Glass.
2. Coated products shall be magnetically sputtered vacuum deposition (MSVD).
3. Edge Deletion: When Low-E coatings are used within an insulating unit, coating shall be edge deleted to completely seal the coating within the unit.
    a. The edge deletion should be uniform in appearance (visually straight) and remove at least 95 percent of the coating.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify prepared openings for adequacy to receive glass.

B. Verify that openings for glazing are correctly sized and within tolerance.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

D. Report in writing any conditions that may be detrimental to the Work.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Check that glass is free of edge damage or face imperfections.

3.3 INSTALLATION

A. General: Install glazing types at locations indicated on Drawings, according to glazing manufacturer's recommendations and as specified herein.

B. Glass Glazing:

1. Positioning Glass: Orient pattern and draw of glass pieces in same direction. Set all sheet glass so that any waves, etc. are horizontal.
2. Do not cut, nip or abrade tempered glass.
3. Watershed: Gunnable sealants, when applied as a cap head, shall form a bevel or watershed away from the glass. When tape is used to the sightline, it shall form a watershed when compressed. Do not undercut a sealant, compound, or tape below the sightline. Tool and finish sealant as required. Used tooling solution recommended by the sealant manufacturer.
4. Positive Contact:
   a. When applying a heel bead, lap onto the glass a minimum of 3/16 inch.
   b. When applying a toe bead, whether continuous or a corner seal, make certain it is large enough to contact both the glass and sash. Install the sealant prior to glass placement.
5. Setting blocks shall be 1/16 inch less than the full rabbet width, minimum length of 4 inches and high enough to provide the recommended minimum bite and edge clearance for the glass. Center blocks at 1/4 points unless otherwise recommended by the glass manufacturer.
6. Provide spacer-shims at a maximum of 24 inches on center.
7. Clearances: Observe minimum face clearances, edge clearance and glass bite as recommended by the glass and sealant manufacturers.
8. Tape Installation: Do not install glazing tapes more than one day ahead of glass placement. Remove the paper backing from the tape only when the lite is ready to be installed. Do not stretch the tape to make it fit. Do not overlap the ends of the tape. Instead, butt ends together, and when corners are butted together, daub with sealant to assure a positive seal.
9. Glazing tapes must be kept under proper compression.
10. Glazing stops shall be installed so that stop or frame does not bear directly against glass.
11. All glazing channels/rabbets shall be weeped so there is no standing water in contact with the insulating glass perimeter seal.

3.4 CLEANING

A. Clean work under provisions of Division 01.

B. Remove glazing materials from finish surfaces.

C. Remove temporary labels after work is complete.

D. Clean glass.

3.5 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Division 01.

B. Replacement: At completion of building construction and prior to its acceptance, all broken, cracked, excessively scratched, or otherwise imperfect glazing materials included under this Section shall be replaced with new glazing materials of the type specified, as directed by the Architect, and at no additional cost to the Owner.

END OF SECTION

SECTION 08 88 13

FIRE RATED GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire rated glass and glazing for windows and doors.

1.2 RELATED SECTIONS

A. Section 08 11 13 – Hollow Metal Doors and Frames: Glazed doors and windows.

B. Section 08 81 00 – Glass Glazing.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. American National Standards Institute (ANSI) – ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings.
2. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
3. ASTM C1036 – Standard Specification for Flat Glass.
4. ASTM C1048 – Standard Specification for Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.
5. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.
6. ASTM E2010 – Standard Test Method for Positive Pressure Fire Tests of Window Assemblies.
7. ASTM E2074 – Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies.
8. Consumer Product Safety Commission (CPSC) – CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials.
9. GANA Glazing Manual.
10. GANA Sealant Manual.
11. NFPA 80 – Fire Doors and Windows.
12. NFPA 252 – Standard Methods of Fire Tests of Door Assemblies.
13. NFPA 257 – Fire Tests of Window Assemblies.
14. SGCC – Safety Glazing Certification Council – Certified Products Directory.

15. UL 9 – Fire Tests of Window Assemblies.
16. UL 10B – Fire Tests of Door Assemblies.
17. UL 10C – Positive Pressure Fire Tests of Door Assemblies.
18. UL 263 – Fire Tests of Building Construction and Materials.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data on Glass Types Specified: Provide structural, physical and environmental characteristics, size limitations, and special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, and special handling or installation requirements.

D. Samples:

1. Glass: Submit two samples, 12 inches x 12 inches in size, illustrating each type of glazing.
2. Glazing Sealant: Submit 3 inch long bead of glazing sealant, color as selected.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual, FGMA Sealant Manual for glazing installation methods.

B. Installer's Qualifications: The installation shall be performed only by an installation firm normally engaged in this business. All work shall be performed by qualified mechanics that specialize in glazing and glass installation.

C. Safety glazing shall meet the requirements of 2022 CBC Section 2406 and shall be identified in accordance with 2022 CBC Sections 2403.1 and 2406.3, with identification etched in glass.

D. Fire Protective Rated Glass:

1. Fire rated glazing shall be under current follow-up service by a nationally recognized independent testing laboratory and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.
    a. Each lite shall bear permanent, non-removable label certifying it for use in tested and rated fire protective assemblies.
2. Fire Protective Glazing Products for Door Assemblies: Products identical to those tested per ASTM E2074 and UL 10B, labeled and listed by UL.

1.6 DEFINITIONS

A. Fire-Rated Glazing Assembly Identification Markings per CBC Sections 703.4 and 716.3:

Fire Test Standard	Marking	Definition of Marking
ASTM E119 or UL 263	W	Meets wall assembly criteria.
NFPA 257 or UL 9	OH	Meets fire window assembly criteria including the hose stream test.
NFPA 252 or UL 10B or UL 10C	D	Meets fire door assembly criteria
	H	Meets fire door assembly hose stream test.
	T	Meets 450 degree F temperature rise criteria for 30 minutes.
	XXX	The time in minutes of the fire resistance or fire protection rating of the glazing assembly.

1.7 JOB AND ENVIRONMENTAL CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 48 hours after installation of glazing compounds.

1.8 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop Drawings.

1.9 COORDINATION

A. Coordinate Work with glazing frames, wall openings, and adjacent Work.

1.10 WARRANTY

A. Manufacturer’s Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty document. Manufacturer’s warranty is not intended to limit other rights that the Owner may have under the Contract Documents.

1. Warranty Period, 20-minute rated glass: Lifetime warranty from date of shipping.
2. Warranty Period, 45-minute rated glass: Five year warranty from date of shipping.

PART 2 PRODUCTS

2.1 GENERAL

A. All glass shall be graded and meet requirements of ASTM C1036 and ASTM C1048, Type I, quality q3. Each light of glass delivered and installed shall have affixed thereto the manufacturer's grade label.

B. Glazing material installed in Hazardous Locations, subject to human impact, shall be certified and permanently labeled as meeting applicable requirements referenced in NFPA 80.

1. CPSC 16 CFR 1201, Category I and II.

C. Each piece of fire-rated glazing material shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory, fire rating period, and safety glazing standards.

D. Sealants shall comply with regulations of South Coast Air Quality Management District Rule 1168 for VOCs.

2.2 GLASS TYPES

A. TYPE GL-X: Fire Protective Rated Glass in 20 minute assemblies: ***Door #217A, 236, 237***

1. Acceptable Manufacturers:
   a. Safti First. Product: SuperLite I.
   b. Technical Glass Products (TGP).
   c. McGrory Glass.
   d. Pilkington.
   e. Vetrotech Saint-Gobain.
   f. Substitutions: Under provisions of Division 01.
2. Material: 1/4 inch thick, 20 minute rated assembly consisting of specialty tempered clear float glass with D-20 marking. Product shall meet the requirements of ANSI Z97.1, CPSC 16 CFR 1201 Category I and II, and UL 10C.

B. TYPE G-4: Fire Resistive Rated Glass in 45 minute assemblies: ***Door #311, 314A***

1. Acceptable Manufacturers:
   a. Safti First. Product: SuperLite II-XL 45.
   b. Technical Glass Products (TGP).
   c. McGrory Glass.
   d. Pilkington.
   e. Vetrotech Saint-Gobain.
   f. Substitutions: Under provisions of Division 01.
2. Material: 1 inch thick, 45 minute rated assembly consisting of inboard and outboard sheets of clear tempered glass with a fire resistive interlayer marked in accordance with CBC Sections 703.4 and 716.3. Product shall meet the requirements of ANSI Z97.1, CPSC 16 CFR 1201 Category I and II, and UL 10C.

2.3 GLAZING SEALANT

A. Fire-Rated Glazing Tape: UL 10B and UL 10C compliant, high performance fire-rated glazing tape; Pemko FG3000 or accepted equal. Glazing tape shall be installed on both sides of frame at all vision lites in fire-rated doors. Tape shall be compatible with and acceptable for use with the type of glazing and window frame to which they are applied.

2.4 GLAZING ACCESSORIES

A. Setting Blocks: Fire-Rated: Calcium silicate blocks, chemically compatible with sealant used.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, minimum 3 inches long by one half the height of the glazing stop by thickness to suit application.

C. Glazing Tape: 100 percent solids by weight, highly adhesive and elastic, cross-linked butyl rubber preformed tape with a continuous integral EPDM shim; 57 Shore 00 durometer hardness; black color; Tremco POLYshim II Tape or accepted equal.

D. Glazing Splines: Resilient polyvinyl chloride extruded shape to suit glazing channel retaining slot; black color.

E. Miscellaneous: Furnish all primers-sealers, setting blocks, shims, spacers, compression seals, etc., as required for a first class workmanlike job.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify prepared openings for adequacy to receive glass.

B. Verify that openings for glazing are correctly sized and within tolerance.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

D. Report in writing any conditions that may be detrimental to the Work.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Check that glass is free of edge damage or face imperfections.

3.3 INSTALLATION

A. General: Install glazing types at locations indicated on Drawings, according to glazing manufacturer's recommendations and as specified herein.

B. Glass Glazing:

1. Positioning Glass: Orient pattern and draw of glass pieces in same direction. Set all sheet glass so that any waves, etc. are horizontal.
2. Do not cut, nip or abrade tempered glass.
3. Watershed: Gunnable sealants, when applied as a cap head, shall form a bevel or watershed away from the glass. When tape is used to the sightline, it shall form a watershed when compressed. Do not undercut a sealant, compound, or tape below the sightline. Tool and finish sealant as required. Used tooling solution recommended by the sealant manufacturer.
4. Positive Contact:

a. When applying a heel bead, lap onto the glass a minimum of 3/16 inch.

b. When applying a toe bead, whether continuous or a corner seal, make certain it is large enough to contact both the glass and sash. Install the sealant prior to glass placement.

5. Setting blocks shall be 1/16 inch less than the full rabbet width, minimum length of 4 inches and high enough to provide the recommended minimum bite and edge clearance for the glass. Center blocks at 1/4 points unless otherwise recommended by the glass manufacturer.
6. Provide spacer-shims at a maximum of 24 inches on center.
7. Clearances: Observe minimum face clearances, edge clearance and glass bite as recommended by the glass and sealant manufacturers.
8. Tape Installation: Do not install glazing tapes more than one day ahead of glass placement. Remove the paper backing from the tape only when the lite is ready to be installed. Do not stretch the tape to make it fit. Do not overlap the ends of the tape. Instead, butt ends together, and when corners are butted together, daub with sealant to assure a positive seal.
9. Glazing tapes must be kept under proper compression.
10. Glazing stops shall be installed so that stop or frame does not bear directly against glass.
11. Install glazing in fire-rated assemblies to requirements of NFPA 80.
    a. Install so that appropriate UL markings remain permanently visible.

3.4 CLEANING

A. Clean work under provisions of Division 01.

B. Remove glazing materials from finish surfaces.

C. Remove temporary labels after work is complete.

D. Clean glass.

3.5 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Division 01.

B. Replacement: At completion of building construction and prior to its acceptance, all broken, cracked, excessively scratched, or otherwise imperfect glazing materials included under this Section shall be replaced with new glazing materials of the type specified, as directed by the Architect, and at no additional cost to the Owner.

END OF SECTION

SECTION 08 91 19

FIXED LOUVERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Continuous wall louvers.

1.2 RELATED WORK

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 07 62 00 – Sheet Metal Flashing and Trim.

C. Section 07 92 00 – Joint Sealants.

D. Section 09 91 00 – Painting.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. AMCA 500-L – Laboratory Methods of Testing Louvers for Rating.
2. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Indicate on shop drawings layout, elevations, dimensions and tolerances; head, jamb, and sill details, blade configuration, screening, and frames.

C. Submit manufacturer's installation instructions under provisions of Division 01.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacture of AMCA certified louvers with sufficient documented experience.

B. Louvers shall bear Air Movement and Control Association (AMCA) Certified Ratings Seals for air performance and water penetration ratings.

1.6 COORDINATION

A. Coordinate work of this Section with installation of framing, flashings, joint sealants, interior and exterior wall finishes.

1.7 WARRANTY

A. Product shall be free of defective materials or workmanship for a period of one year from date of installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Wonder Metals Corporation, Redding, CA; 800-366-5877, www.wondermetals.com. Product: Model SDL-6.
   2. C/S Group, Cranford, NJ; 800-526-6930, www.c-sgroup.com.
   3. The Airolite Company, LLC, Schofield, WI; 715-841-8757, www.airolite.com.

B. Substitutions: Under provisions of Division 01.

2.2 MATERIAL

A. Steel Sheet: ASTM A653, G90 galvanized.

2.3 COMPONENTS

A. Louver Blades:
   1. Slope: 36 degrees.
   2. Blade Type: Fixed, drainable.
   3. Steel Thickness: 16 gauge.

B. Frame:
   1. Shape: Channel.
   2. Head, jamb and sill material thickness: 16 gauge steel.
   3. Corners: Boxed.

C. Fasteners and Anchors: Stainless steel or type as recommended by manufacturer.

2.4 ACCESSORIES

A. Flashings: Of same material as louver frame.

B. Insect Screen and Frame: Galvanized steel frame with 18 x 14 galvanized insect mesh, fabricated by louver manufacturer. Install on interior side of louver.

C. Sealants: As specified in Section 07 92 00.

2.5 FABRICATION

A. Louver Size: 6 inches deep, face measurements as indicated on Drawings, but not to exceed 40 square feet per panel. Nominal free area opening percentage of 58 percent, with storm-proof blades.

B. Head and Sill Members: Roll formed to required shape, one piece per location.

C. All welded construction.

D. Screens: Screw to louver frame.

2.6 FINISHES

A. Factory Finish: Prime paint finish.

B. Site Finish: Paint finish under provisions of Section 09 91 00. Color as selected by Architect.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify that prepared openings and flashings are ready to receive work and opening dimensions are as indicated on shop drawings.

B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Secure louvers in opening framing with concealed fasteners.

D. Louver frame shall be anchored to structure with concealed fasteners appropriate for use with type of adjacent construction. Fasteners shall securely fasten louver frame to wall construction involved. Fasteners shall provide stiffness and rigidity to keep frames square, in accurate position without twisting, buckling or warping. Fasteners to framing substrate shall be the following minimums; greater as required by the louver manufacturer or as conditions warrant:

1. Masonry: 1/4 inch diameter stainless steel wedge anchors at 24 inches on center with 1-1/2 inch minimum embedment into substrate and 2 inch minimum edge distance to face of substrate.

E. Install metal flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

F. Install insect screen on the interior face of the louver frame with mechanical fasteners.

G. Install perimeter sealant to method required to achieve performance criteria and installation criteria described in Section 07 92 00.

3.3 CLEANING

A. Clean surfaces and components per manufacturer’s recommendations.

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal stud and joist framing and accessories at interior locations.

1.2 RELATED SECTIONS

A. Section 05 40 00 – Cold-Formed Metal Framing.

B. Section 07 84 00 – Firestopping.

C. Section 07 92 00 – Joint Sealants.

D. Section 08 11 13 – Hollow Metal Doors and Frames.

E. Section 09 29 00 – Gypsum Board.

F. Section 09 81 00 – Acoustic Insulation.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM A924/A924M – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
3. ASTM C645 – Standard Specification for Nonstructural Steel Framing Members.
4. ASTM C754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
5. ASTM C1513 – Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
6. SFIA – Steel Framing Industry Association.
7. SSMA – Steel Stud Manufacturers Association.
8. SSPC Paint 20 – Zinc Rich Primers.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings:

1. Indicate component details, stud layout, framed openings, anchorage to structure, type and location of fasteners and accessories or items required of other related work.
2. Describe method for securing studs to tracks, splicing and for blocking and reinforcement to framing connections.

C. Product Data: Submit data describing standard framing member materials and finish, product criteria, load charts and limitations.

D. Manufacturer's Installation Instructions: Submit special procedures, perimeter conditions requiring special attention.

E. Evaluation Reports: For products not covered in SSMA or SFIA standards, submit manufacturer's current ICC report reviewed per the applicable building code.

1.5 SYSTEM DESCRIPTION

A. Interior Walls and Ceilings: Metal stud and joist framing system with batt type acoustic insulation specified in Section 09 81 00 and interior gypsum board specified in Section 09 29 00.

B. Maximum Allowable Deflection:

1. 1:120 span at gypsum board finish.
2. 1:240 span at ceramic tile finishes.

C. Wall and Ceiling Systems:

1. Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.

1.6 QUALITY ASSURANCE

A. Framing members shall be provided by a member of the Steel Stud Manufacturer’s Association (SSMA) or Steel Framing Industry Association (SFIA).

B. Perform Work in accordance with ASTM C754.

C. Comply with 2022 CBC, Chapter 22, Section 2211.

D. Form, fabricate, install, and connect components in accordance with ML/SFA 540.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section.

B. Installer: Company specializing in performing Work of this Section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Notify manufacturer of damaged materials received. Do not install damaged materials.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Protect cold-formed metal framing products from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI's "Code of Standard Practice".

1.9 PRE-INSTALLATION MEETING

A. Convene minimum one week prior to commencing Work of this Section under provisions of Division 01.

1.10 COORDINATION

A. Coordinate placement of components within stud framing system.

PART 2 PRODUCTS

2.1 METAL FRAMING SYSTEM

A. Acceptable Manufacturers:

1. ClarkDietrich Building Systems, West Chester, OH; 513-870-1100, www.clarkdietrich.com.
2. Marino\WARE, South Plainfield, NJ; 800-627-4661, www.marinoware.com.
3. CEMCO, Pittsburg, CA; 925-473-9340, www.cemcosteel.com.
4. SCAFCO Steel Stud Company, Spokane, WA; 509-343-9000, www.scafco.com.

B. Substitutions: Under provisions of Division 01.

2.2 COMPONENTS

A. Framing System Components:

1. 20 Gauge and Thinner: Manufactured per ASTM C645 with material meeting the requirements of ASTM A1003, Non-structural Grade 33 (NS33).
2. 18 Gauge: Manufactured with material meeting the requirements of ASTM A1003, Structural Grade 33, Type H (ST33H).
3. 16 Gauge and Thicker: Manufactured with material meeting the requirements of ASTM A1003, Structural Grade 50, Type H (ST50H).

B. Studs and Joists: ASTM A653/A653M non-load bearing rolled steel, channel shaped, punched for utility access, depths, gauges, and spacing as indicated on the Drawings.

C. Tracks and Headers: Same material and thickness as studs.

D. Slotted Track: Slotted track system for positive attachment of metal studs to track, for Head of Wall expansion joint movement (cyclic) and static Joint System in fire-rated construction, as detailed and required on Drawings, in compliance with UL 2079 cyclical movement ± 1/2 inch overall 1 inch movement. Products: BlazeFrame DSL at rated assemblies and MaxTrak at non-rated assemblies as manufactured by ClarkDietrich Building Systems or accepted equal.

1. Forming steel shall conform to ASTM A1003, Structural Grade 33, Type H (ST33H).

2. Formed steel shall be galvanized in accordance with ASTM A653 for a Class G-40 by the hot dip process.
3. Slotted track shall be provided in standard widths and gauges, as required and indicated on Drawings. Down standing legs shall be nominally 2-1/2 inches and shall be provided with 1-1/2 inch slots at 1 inch on center.
4. Fasteners:
    a. For attachment of studs to slotted track, minimum No. 8 corrosion resistant by 1/2 inch waferhead screws.
    b. For attachment of slotted track to overhead structural element, as provided for the structural details affecting the work.

E. Furring and Bracing Members: Of same material as studs; thickness to suit purpose.

F. Sheet Metal Backing: 16 gauge, unless noted otherwise on Drawings.

G. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.

H. Fasteners: ASTM C1513, self-drilling, self-tapping corrosion resistant screws.

I. Anchorage Devices: As indicated on Drawings.

J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type II organic zinc rich.

2.3 FINISH

A. Framing Members and Connections:
1. Provide galvanized finish per ASTM A653 with G-40 minimum coating weight. No equivalent coatings allowed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify rough-in utilities are in proper location.

3.2 INSTALLATION

A. Install metal framing per ASTM C754 and as indicated on Drawings.

B. Align and secure top and bottom runners as indicated on Drawings.

C. Place two beads of acoustic sealant between tracks and substrate, studs and adjacent construction, to achieve acoustic seal.

D. Place two beads of acoustic sealant between studs and adjacent vertical surfaces to achieve acoustic seal.

E. Framing at openings shall be as shown on Drawings. Install intermediate studs at same spacing as wall studs.

F. Install studs vertically at 16 inches on center unless otherwise noted on Drawings.

G. Install joists horizontally at 16 inches on center unless otherwise noted on Drawings.

H. Align stud web openings horizontally.

I. Secure studs to tracks as indicated on Drawings.

J. Stud splicing not permissible.

K. Fabricate corners using minimum of three studs.

L. Double stud at wall openings and door and window jambs, not more than 2 inches from each side of openings.

M. Brace stud framing system rigid.

N. Coordinate erection of studs with requirements of door frames and window frames; install supports and attachments.

O. Backing/Blocking: Shall be provided for all wall and ceiling finishes and for the supporting and anchorage of products, fixtures and equipment for all trades, including, but not limited to, toilet room accessories, casework, mirrors, trim, applied wall finishes, wall bumpers, plumbing and electrical fixtures, etc. Coordinate size, type, and location of backing and supports with manufacturer or supplier of items requiring backing/blocking.

P. Refer to Drawings for indication of partitions extending stud framing through ceiling to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Install extended leg top track for slip connection.

Q. Refer to Drawings for indication of partitions through ceiling, but not to structure above. Install diagonal stud bracing staggered at 48 inches on center to structure above. Stud bracing width and gauge shall match that of the stud framing below.

R. Coordinate placement of insulation in stud spaces after stud frame erection.

3.3 ERECTION TOLERANCES

A. Maximum Variation From Indicated Position: 1/8 inch in 10 feet (non-cumulative).

B. Maximum Variation From Plumb: 1/8 inch in 10 feet (non-cumulative).

END OF SECTION

SECTION 09 22 26.23

METAL SUSPENSION SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Suspended gypsum board ceiling metal framing system.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-in-Place Concrete.

B. Section 05 12 00 – Structural Steel Framing.

C. Section 05 31 00 – Steel Decking.

D. Section 09 29 00 – Gypsum Board.

E. Divisions 21 - 23 – Mechanical.

F. Divisions 25 - 28 – Electrical.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM A641/A641M – Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
2. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. ASTM C645 – Standard Specification for Nonstructural Steel Framing Members.
4. ASTM C754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
5. ASTM C840 – Standard Specification for Application and Finishing of Gypsum Board.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data: Submit manufacturer’s descriptive literature and product specification for each product.

C. Shop Drawings:

1. Indicate typical layout including dimensions.
2. Submit drawings showing field measured dimensions.
3. Submit detail drawings of special accessory components not included in manufacturer's product data.

1.5 SYSTEM DESCRIPTION

A. Suspended metal framing system for single layer suspended gypsum board ceiling.

B. Alternative systems conforming to CBC Table 2508.1 may be proposed. Conform to substitution requirements per Division 01. Include in proposal specifications and shop drawings showing framing layout, member sizes, hanger locations, fastening, and attachment details.

C. Alternative suspended gypsum board ceiling framing systems may be submitted with appropriate current ICC-ES Report. Install in accordance with manufacturer's instructions and ICC-ES Report. Conform to substitution requirements per Division 01.

D. Substitutions are subject to agency approval.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section with a minimum five years' experience.
2. Installer Qualifications: Firm specializing in installing work specified in this Section with experience on at least five projects of similar nature in past three years.

B. Coordinate work in this Section with work in related Sections.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Storage and Protection:

1. Store materials in a dry secure place. Protect from weather, surface contaminants, corrosion, construction traffic, and other potential damage.
2. If materials are stored outdoors, stack materials off ground, supported on a level platform, and fully protected from the weather.

D. Handling: Handle materials carefully to prevent damage. Remove damaged materials and provide new items.

PART 2 PRODUCTS

2.1 MATERIALS

A. Galvanized or galvannealed steel conforming to ASTM A653/A653M, minimum G40 or Z120.

B. Grade:
   1. 16 gauge and heavier, F_y = 50 ksi
   2. 18 gauge and lighter, F_y = 33 ksi minimum.

2.2 COMPONENTS

A. Frame Members: ASTM C645.
   1. Main Runners: Cold-rolled steel channels; 1-1/2 inch by 16 gauge; 0.475 pounds per foot, minimum.
   2. Cross-Furring: Cold-rolled steel hat channels: 7/8 inch by 22 gauge.

B. Wire Hangers: ASTM A641/A641M, zinc-coated wire, Class 1, soft temper, pre-stretched.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine job site conditions and verify field dimensions. Verify hangers will not interfere with other work.

3.2 INSTALLATION

A. Install ceiling metal suspension system in accordance with accepted shop drawings, and as specified in this Section.

B. Install ceiling metal suspension system after major above ceiling work is complete. Coordinate location of hangers with other work.

C. Hang suspension system independent of walls, columns, ducts, pipes and conduits.

D. Install cross furring as recommended by gypsum board manufacturer to prevent sagging at 16 inches on center maximum for single layer of 5/8 inch gypsum board, saddle tied to main runners using one strand of No. 16 gauge or two strands of No. 18 gauge tie wire.

E. Use No. 8 gauge hanger wires saddle tied to main runners as follows:
   1. 3 feet-0 inches on center maximum, where main runners are spaced 4 feet-0 inches on center.
   2. 3 feet-6 inches on center maximum, where main runners are spaced 3 feet-6 inches on center.
   3. 4 feet-0 inches on center maximum, where main runners are spaced 3 feet-0 inches on center.

F. Splice main runners by lapping and interlocking flanges 12 inches minimum and tying near each end double loops of No. 16 gauge tie wire.

G. Splice cross-furring by lapping and interlocking pieces 8 inches minimum and tying near each ends with double loops of No. 16 gauge tie wire.

H. Fasten hanger wires with not less than three tight turns. Fasten bracing wires with four tight turns. Make all tight turns with a distance of 1-1/2 inch. Hanger or bracing wire anchors to the structure should be installed in such a manner that the direction of the wire aligns as closely as possible with the direction of the forces acting on the wire. Wire turns made by machine where both strands have been deformed or bent in wrapping can waive the 1-1/2 inch requirement, but the number of turns should be maintained, and as tight as possible.

I. Separate all ceiling hanging and bracing wires at least 6 inches from all unbraced ducts, pipes, conduit, etc. It is acceptable to attach lightweight items, such as single electrical conduit not exceeding 3/4 inch nominal diameter, to hanger wires using connectors acceptable to Architect.

J. When drilled-in concrete anchors or shot-in anchors are used in reinforced concrete for hanger wires, one out of ten shall be tested for 200 pounds tension. When drilled-in concrete anchors are used for bracing wires, one out of two shall be field tested for 440 pounds tension. Shot-in anchors in concrete are not permitted for bracing wires. Refer to CBC Chapter 19 if any shot-in or drilled-in anchor fails.

K. Provide trapeze or other supplementary support members at obstructions to typical hanger spacing. Provide additional hangers, struts or braces as required at all ceiling breaks, soffits, or discontinuous areas. Where hanger wires are more than one in six out of plumb, provide counter-sloping wires.

3.3 BRACING ASSEMBLIES

A. Provide bracing assemblies consisting of a compression strut and four 12 gauge splayed bracing wires oriented 90 degrees from each other. Splayed bracing wires shall be taut and shall not exceed 45 degrees from the ceiling plane. Splices in bracing wires are not permitted. Space bracing assemblies as follows:

1. Not more than 12 feet by 12 feet on center.
2. Not more than 1/2 of the spacing given above from the perimeter wall and at the edge of vertical ceiling offsets.

B. Ceiling grid members may be attached to no more than two adjacent walls, and at least 1/2 inch free of other walls. Where walls run diagonally to ceiling grid system runners, one end of main and cross runner should be free, and a minimum 1/2 inch clear of wall.

C. Suspended ceiling systems with a ceiling area of 144 square feet or less surrounded by walls which connect directly to the structure above, do not require bracing assemblies when attached to two adjacent walls.

3.4 SUPPORT AND ANCHORAGE OF LIGHT FIXTURES AND MECHANICAL SERVICES

A. Support drop-in light fixtures and ceiling mounted mechanical air terminals and services directly by main runners or by supplemental framing which is supported by main runners and positively attached with screws or other approved connectors.

B. Attach surface mounted fixtures to main runners with a positive clamping device made of minimum 14 gauge material. Rotational spring clamps do not comply.

3.5 TOLERANCES

A. Maximum Variation from True Plane: 1/4 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 24 00

PORTLAND CEMENT PLASTERING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal furring and lathing.

B. Building wrap (weather-resistive barrier) under metal lath, and over rigid insulation sheathing.
   1. Provide a two-layer building wrap system as follows:
      a. One layer of kraft building paper over one layer of HDPE product.
      b. Flashing as recommended by building wrap manufacturer.

C. Three-coat Portland cement plaster system with integral color acrylic finish coat.

1.2 RELATED SECTIONS

A. Section 05 40 00 – Cold-Formed Metal Framing.

B. Section 07 25 00 – Weather Barriers.

C. Section 07 21 00 – Thermal Insulation: Rigid insulation.

D. Section 07 92 00 – Joint Sealants.

E. Section 09 29 00 – Gypsum Board: Mat-Faced Gypsum Sheathing.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:
   1. ASTM A641/A641M – Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
   2. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   3. ASTM A924/A924M – Standard Specification for General Requirements for Sheet Steel, Metallic Coated by the Hot-Dip Process.
   4. ASTM A1011/A1011M – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
   5. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.

6. ASTM C150 – Standard Specification for Portland Cement.
7. ASTM C206 – Standard Specification for Finishing Hydrated Lime.
8. ASTM C841 – Standard Specification for Installation of Interior Lathing and Furring.
9. ASTM C897 – Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters.
10. ASTM C926 – Standard Specification for Application of Portland Cement-Based Plaster.
11. ASTM C954 – Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
12. ASTM C1002 – Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
13. ASTM C1063 – Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
14. ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
15. ASTM D779 – Standard Test Method for Water Resistance of Paper, Paperboard, and Other Sheet Materials by the Dry Indicator Test Method.
16. ASTM D828 – Standard Test Method for Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus.
17. ASTM D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
18. ASTM D1653 – Standard Test Methods for Water Vapor Transmission of Organic Coating Films.
19. ASTM D4060 – Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
20. ASTM D4541 – Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
21. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
22. ASTM E96 – Water Vapor Transmission of Materials.
23. ASTM G155 – Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.
24. FS TT-C-555 – Coating, Textured (for Interior and Exterior Masonry Surfaces).
25. PCA Portland Cement Plaster (Stucco) Manual.

1.4 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Provide product data on building wrap, furring and lathing components, plaster materials, characteristics and limitations of products specified, and plastering accessories.

C. Submit manufacturer's installation instructions under provisions of Division 01.

D. Provide two 12 inch x 12 inch samples of plaster system for each type of color and texture scheduled for installation.

1.5 QUALITY ASSURANCE

A. Applicator: Company specializing in cement plaster work sufficient documented experience.

B. Apply cement plaster system in accordance with ASTM C926.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery, storage, and handling in accordance with provisions of Division 01.

1. Deliver manufactured products to job site in their original unopened containers with labels intact and legible at the time of use.
2. Do not permit scattering of materials or equipment but use necessary means to ensure neatness of the site and structure at all times.
3. Perform cleaning of tools and equipment only in the area designated for that purpose.

B. Protection: Use means necessary to protect lath and plaster materials before, during and after installation and to protect the installed work and materials of other trades.

C. Replacements: In the event of damage, immediately make repairs and replacements necessary to the approval of the Architect and at no additional cost to Owner.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not apply plaster when substrate or ambient air temperature is less than 35 degrees F nor more than 90 degrees F. If freezing is expected within the next twelve hours, do not apply plaster.

B. Maintain minimum ambient temperature of 35 degrees F during and after installation of plaster.

C. Protect plaster from uneven and excessive evaporation during any weather conditions.

PART 2 PRODUCTS

2.1 PLASTER MATERIALS

A. Cement: ASTM C150, Normal – Type I or Type II, low alkali; gray color; Portland Cement.

B. Lime:

1. ASTM C206, Type S.
2. Plasticity Agents to Replace Lime: Conform to CBC Section 2507 with Current ICC-ES Report. Acceptable Products: Gibco DRY admixture and PRF Liquid admixture by Gibco Industries, Pozalite by Stockton Products, or accepted equal.

C. Aggregate: In accordance with ANSI/ASTM C897, except that gradation shall meet the following requirements:

Sieve Size	Percent Retained on each sieve (by weight)	
	Maximum	Minimum
No. 4	0	—
No. 8	10	0
No. 16	40	10
No. 30	65	30
No. 50	90	70
No. 100	100	90-95

1. The sand shall have more than 50 percent retained between any two consecutive sieves nor more than 25 percent between Nos. 50 and 100 sieves.

D. Water: Clean, fresh, potable and free of mineral or organic matter that can affect plaster system components.

E. Acrylic Finish Coat: Vapor permeable, 100 percent acrylic polymer finish coat with crushed mineral aggregates, meeting the following performance criteria:

Property	Test Method	Results
Adhesion to concrete	ASTM D4541	100 psi
Vapor permeability	ASTM D1653 Method A Method B	 3.0 dry perms 9.7 wet perms
Abrasion resistant (1000 cy)	ASTM D4060	6.8 percent weight loss
Tensile strength Nontextured film Textured film	ASTM D412	 200 psi 20 psi
Elongation Nontextured film	ASTM D412	 30 percent
Wind driven rain	Federal Spec TT-C-555B	 Pass
Accelerated weathering 2000 hours	ASTM G155	No cracking, blistering, checking or adhesion loss
Freeze-thaw resistance of dry film (25 cy)	Lab method	Pass
Dirt pickup	Lab method	None
Chemical resistance	ASTM D1308	Good resistance to mild acids, alkalis and salts
Flame Spread	ASTM E84	15 maximum
Smoke Developed	ASTM E84	10 maximum

1. Acceptable Manufacturers:
   a. Dryvit Weatherlastic.

b. Omega Akroflex.

c. ParexLaHabra DPR Finish.

d. Substitutions: Under provisions of Division 01.

2. Color and Texture: As selected by Architect.

3. Accessories: Leveler and primer as manufactured by the finish coat manufacturer.

2.2 LATH AND LATH ACCESSORIES

A. General: Conforming to ASTM C1063; fabricated from prime galvanized steel with G60 zinc coating by the hot-dipped method conforming to ASTM A653/A653M, 26 gauge minimum.

B. Metal Lath: Self furred, grooved, galvanized expanded metal flat diamond mesh; weighing 3.4 pounds per square yard; continuous horizontal grooves 1/4 inch deep at 6 inches on center as manufactured by ClarkDietrich Building Systems, Cemco, Amico or accepted equal.

1. Acceptable Alternative Metal Lath: Structa Mega Lath as manufactured by Structa Wire Corporation with the following characteristics:

a. Weight: 1.95 pounds per square yard.

b. No. 17 gauge x No. 16 gauge galvanized cold-rolled steel wire welded to form 0.7 inch x 1.5 inch openings.

c. Six secondary cold-rolled flat longitudinal wires spaced nominally every 5-3/8 inches to form a twin track.

d. Furring:

1) Width of Furring Leg: 1/4 inch.

2) Furring Height: 1/4 inch to underside of cross wire.

3) Furring Spacing: 2-1/8 inch on center.

4) Every cross wire is furred.

C. Casing Beads: Formed steel, minimum 26 gauge thick; of longest possible length; sized and profiled to suit application; galvanized finish; No. 66N casing bead as manufactured by ClarkDietrich Building Systems, Cemco, Amico, Brand X Metals Inc., or accepted equal.

D. Weep Screeds: Formed steel, minimum 26 gauge thick; square flange, 3-1/2 inch high leg, of longest possible length; sized and profiled to suit application; galvanized finish; Model: WS78-350U weep screed as manufactured by ClarkDietrich Building Systems, Cemco, Amico, Brand X Metals Inc., or accepted equal.

E. J-Weeps: Formed steel, minimum 26 gauge thick; of longest possible length; sized and profiled to suit application; galvanized finish; Model: JWLB J-weep with 2 inch nailing flange and weep holes as manufactured by ClarkDietrich Building Systems, Cemco, Amico, Brand X Metals Inc., or accepted equal.

F. Control Joints: Formed steel; minimum 26 gauge accordion profile, 1/2 inch ground with expanded metal flanges each side; of longest possible length; sized and profiled to suit application; galvanized finish; No. XJ 15, as manufactured by ClarkDietrich Building Systems, Cemco, Amico, Brand X Metals Inc., or accepted equal.

G. Inside Corner Control Joint: Formed steel, minimum 26 gauge thick; 1-1/2 inch legs, of longest possible length; sized and profiled to suit application; galvanized finish; ICT078 112 as manufactured by Stockton Products, ClarkDietrich Building Systems, Cemco, Amico, or accepted equal.

H. Soffit Vent: 26 gauge, ASTM: A653 LFQ galvanized finish, perforated with 1/8 inch Vent Holes, Series SVR Soffit Vent/Reveal Screed as manufactured by Stockton Products, Amico, Brand X Metals Inc., or accepted equal.

I. Soffit Drip Mold: No. 5 stucco drip, galvanized finish with 3-1/2 inch long vertical leg and 1/2 inch diameter key holes, as manufactured by Stockton Products, ClarkDietrich Building Systems, Cemco, Amico, Brand X Metals Inc., or accepted equal. Provide matching factory miter cut, solid soldered inside and outside corners.

J. Substitutions: Under provisions of Division 01.

2.3 LATH ANCHORAGES

A. Anchorages at metal framing: Install galvanized # 8 wafer head screws at 6 inches on center vertically at each stud x length as required for 3/8 inch penetration into framing members.
   1. ASTM C954, self-drilling and self-tapping screws for heavy gauge steel framing (0.033 inch to 0.112 inch thick). Minimum 500 hour corrosion resistant finish per ASTM B117.
   2. ASTM C1002, self-drilling and self-tapping screws for light gauge steel framing (less than 0.033 inch thick). Minimum 500 hour corrosion resistant finish per ASTM B117.

2.4 BUILDING WRAP (WEATHER RESISTIVE BARRIER)

A. Kraft Building Paper: Asphalt-saturated kraft Grade D breather type sheathing paper exceeding ASTM E2556 Type II performance requirements.
   1. Manufacturer and Product: Henry Super Jumbo Tex 60 Minute Weather-Resistive Barrier as manufactured by Henry Company or accepted equal; ICC ESR-1027.
   2. Properties:
      a. Water Vapor Transmission: 75 grams, 11 perms (MVT) per ASTM E96 (A).
      b. Water Resistance: Greater than 60 minutes per ASTM D779.
      c. Tensile Strength: Tested in accordance with ASTM D828.
         1) Cross Machine Direction: 30 lbf per inch.
         2) Machine Direction: 80 lbf per inch.
      d. Surface Burning Characteristics:
         1) Flame Spread: Less than 100 per ASTM E84.
         2) Smoke Developed: Less than 450 per ASTM E84.

B. HDPE Product: Refer to Section 07 25 00.

2.5 CEMENT PLASTER MIXES

A. Mix and proportion cement plaster in accordance with ASTM C926 and PCA Portland Cement/Stucco Manual. Mix plasticity agents (lime replacement admixtures) in accordance with manufacturer's written instructions and ICC-ES Report.

B. Mix and proportion cement plaster as follows:
   1. Scratch Coat Proportions: One part Portland cement, four parts aggregate and three ounces PRF admixture.
   2. Brown Coat Proportions: One part Portland cement, five parts aggregate and three ounces PRF admixture.
   3. Finish Coat Proportions: Per manufacturer's recommendations.

C. Mix only as much plaster as can be used in one hour.

D. Mix materials dry, to uniform color and consistency, before adding water.

E. Protect mixtures from frost, contamination, and evaporation.

F. Do not retemper mixes after initial set has occurred.

2.6 SEALANTS

A. Sealants used in conjunction with the scratch, brown, and finish coats shall only be the type recommended by the product manufacturer(s).

B. VOC: Comply with regulations of South Coast Air Quality Management District Rule 1168.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify that surfaces and site conditions are ready to receive work.

B. Inspect the installed work of other trades and verify that such work is complete to the point work of this Section may begin.

C. Verify that substrate is plumb, level, square and aligned.

D. Report in writing conditions which might adversely affect the performance of installed lath and plaster to the Architect.

E. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Protect surfaces near the work of this Section from damage or disfiguration.

3.3 BUILDING WRAP (WEATHER RESISTIVE BARRIER) INSTALLATION

A. At all areas of three-coat Portland cement plaster system, apply two-layers of building wrap (weather resistive barrier). Install one layer of kraft building paper over one layer of HDPE product.

B. HDPE and Flexible Flashing Product Installation: Refer to Section 07 25 00.

C. Kraft Building Paper Installation: Apply kraft building paper over HDPE product, horizontally with a 3-inch overlap and a 6-inch end lap and fasten in place. Joints shall be staggered over HDPE product joints.
   1. Extend into jambs of openings and seal corners with tape.
   2. Seal fasteners and penetrations with compatible sealing tape.

3.4 LATH AND LATH ACCESSORIES INSTALLATION

A. Install metal plaster bases and accessories in conformance with ASTM C1063. All vertically placed accessories shall be installed continuously; breaks shall occur only at horizontally placed accessories where they intersect vertically placed accessories.

B. Lath shall be installed as specified in CBC Sections 2507.3 and 2510 and CBC Table 2507.2 for wire fabric lath. The lath shall be installed with the cross wires parallel to the framing and shall be attached with fasteners at the furring crimps.

C. Apply metal lath with the long dimension across the supports with true, even surfaces, and without sags or buckles in accordance with ASTM C841. Orient metal lath on vertical surfaces to provide maximum mechanical bond with plaster. Apply upper sheets to overlap lower sheets.

D. Attach metal lath to framing members at maximum 6 inches on center.

E. Lath shall stand off substrate immediately behind the lath a minimum of 1/4 inch.

F. Install control joints and expansion joints on top of metal lath and wire tie to metal lath on each side.

G. Continuously reinforce internal angles with additional layer of lath, 6 inches wide minimum, except where the metal lath returns 3 inches from corner to form the angle reinforcement. Fasten at perimeter edges only.

H. Place corner bead with mesh at corners. Attach with fasteners as recommended by manufacturer, spaced not more than 18 inches on center. Fasten at outer edges only.

I. Place minimum 4 inch wide strip mesh diagonally at corners of lathed openings. Secure rigidly in place. Extend minimum 8 inches diagonally each direction from point of corner.

J. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.

K. Install accessories to lines and levels.

3.5 CONTROL JOINTS

A. At stud framing, locate exterior control joints every twelve feet maximum in each direction, or as indicated on the Drawings. Vertical control joints shall be continuous; terminate horizontal control joints at vertical control joints. Attach by wiring to metal lath.

3.6 PLASTERING

A. Apply plaster in accordance with CBC Section 2512 and ASTM C926.

B. Control plaster thickness and surface evenness using grounds or screeds. Use temporary screeds or plaster screeds within plastered areas to supplement fixed grounds and screeds.

C. Apply scratch coat to a nominal thickness of 3/8 inch over metal reinforcement. Use sufficient material to form good keys, to completely embed the lath, and to allow for scoring of cement plaster surface.

1. After application, lightly score scratch coat horizontally.
2. If brown coat cannot be applied within four hours, keep scratch coat moist for a minimum of 48 hours before applying brown coat.

D. Apply brown coat to a nominal thickness of 3/8 inch over scratch coat. Use sufficient material and pressure to ensure a tight, uniform bond to scratch coat. Rod brown coat straight and true in all directions.

E. Moist cure brown coat for a minimum of seven days before applying finish coat.

3.7 CURING OF BASE COAT (SCRATCH AND BROWN COATS)

A. Moist cure base coat when ambient temperature is 77 degrees F or higher and/or when relative humidity is below 70 percent and conditions are windy.

B. Moist cure base coat as follows:

1. Only when base coat has set and is hard,
2. In the morning and late afternoon for at least two days,
3. With a fine mist of clean water; do not saturate,
4. Cover with polyethylene sheets to retard evaporation during extreme weather conditions,
5. Do not cure base coat that is subject to freezing.

3.8 ACRYLIC FINISH COAT

A. Surface Preparation:

1. Surfaces to receive acrylic finishes must be structurally sound, clean and dry. Cement plaster base coats must be properly cured and free of all grease, mildew, fungus, efflorescence, and any other contaminant.
2. Contaminants must be removed by wire brush, pressure washing or sandblasting. Efflorescence shall be removed by a diluted acid wash and rinse.
3. Loose deteriorated stucco must be removed and repaired. Soft, dry dusty surfaces must be properly treated to insure adhesion of acrylic finish.
4. Verify that basecoat pH level is below 10.
5. Verify that ambient temperature is at least 40 degrees F and rising during application and for at least 24 hours after application.
6. Apply sealant as recommended by finish coat manufacturer where appropriate at terminations and the junctions of dissimilar materials.
7. Apply a leveler as necessary to achieve a flat surface prior to the application of the finish coat. The leveler shall be manufactured by the same manufacturer as the finish coat and shall be compatible for use with the plaster brown coat, the primer and the acrylic finish coat.

B. Priming:

1. Apply primer to all repaired, patched or chalking surfaces.
2. For improved finish coverage and workability, apply primer over Portland cement base coats.
3. Allow 24 hours for primer to dry before application of acrylic finish coats.
4. Primer shall be from the same manufacturer as the finish coat manufacturer.

C. Application:

1. Refer to manufacturer's instructions for application of leveler, primer and acrylic finish.
2. The finish coat shall be applied and leveled to the minimum required thickness in the same application.
    a. The finish coat shall be applied and textured continually over the wall surface in order to maintain a wet edge and provide a uniform appearance.
    b. Work to corners or joints and do not allow the partially applied material to set up within a distinct wall area.
    c. Achieve the final texture by using trowels or floats with a variety of motions to create the specified texture and to match approved samples.
    d. At exterior corners, the finish coat shall be applied so that the nose wire is covered with a minimum of 1/8 inch of plaster.

3.9 TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 8 feet, properly meeting adjacent surfaces and materials.

3.10 CLEAN UP

A. Promptly remove and clean plaster from all surfaces not scheduled to receive this finish. Verify cleaning recommendations from each substrate manufacturer prior to proceeding with any cleaning operations.

B. Clean up and remove from the site all excess and waste materials generated by the installation of the plaster system.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Gypsum board:
   1. Type X gypsum board.
   2. Moisture resistant gypsum board.
   3. Hi-impact gypsum wall systems.

B. Gypsum sheathing.

C. Cementitious backer board.

D. Accessories.

1.2 RELATED SECTIONS

A. Section 05 40 00 – Cold-Formed Metal Framing.

B. Section 06 20 00 – Finish Carpentry.

C. Section 07 13 26 – Self-Adhering Sheet Waterproofing.

D. Section 07 21 00 – Thermal Insulation.

E. Section 07 25 00 – Weather Barriers.

F. Section 07 84 00 – Firestopping.

G. Section 07 92 00 – Joint Sealants.

H. Section 08 11 13 – Hollow Metal Doors and Frames.

I. Section 09 22 16 – Non-Structural Metal Framing.

J. Section 09 30 00 – Tiling.

K. Section 09 65 00 – Resilient Flooring.

L. Section 09 68 13 – Tile Carpeting.

M. Section 09 77 10 – Sanitary Wall and Ceiling Finishes.

N. Section 09 81 00 – Acoustic Insulation.

O. Section 09 91 00 – Painting.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ANSI A108.11 – Interior Installation of Cementitious Backer Units.
2. ANSI A118.1 – Dry-Set Portland Cement Mortar.
3. ANSI A118.4 – Latex-Portland Cement Mortar.
4. ANSI A118.9 – Test Methods and Specifications for Cementitious Backer Units.
5. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.
6. ASTM C473 – Standard Test Method for Physical Testing of Gypsum Panel Products.
7. ASTM C475/C475M – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
8. ASTM C840 – Standard Specification for Application and Finishing of Gypsum Board.
9. ASTM C954 – Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
10. ASTM C1002 – Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
11. ASTM C1047 – Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
12. ASTM C1177/C1177M – Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
13. ASTM C1278/C1278M – Standard Specification for Fiber-Reinforced Gypsum Panel.
14. ASTM C1280 – Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing.
15. ASTM C1396/C1396M – Standard Specification for Gypsum Board.
16. ASTM C1629 – Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
17. ASTM D3273 – Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
18. ASTM F1267 – Standard Specification for Metal, Expanded, Steel.
19. GA-214 – Recommended Levels of Gypsum Board Finish.
20. GA-216 – Application and Finishing of Gypsum Board.

21. GA-253 – Application of Gypsum Sheathing.
22. GA-600 – Fire Resistance Design Manual.
23. UL Fire Resistance Directory.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data: Submit manufacturer's descriptive literature and product specification for each product.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section with a minimum five years' experience.
   2. Installer Qualifications: Firm specializing in installing work specified in this Section acceptable to manufacturer with experience on at least five projects of similar nature in past three years.

B. Regulatory Requirements: Comply with requirements of CBC Chapter 25.

C. Coordinate work in this Section with work in related Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Storage and Protection: Store materials in a dry secure place; neatly stacked to prevent sagging or damage to edges, ends, and surfaces. Protect from weather, surface contaminants, corrosion, construction traffic, and other potential damage.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Interior Environmental Requirements:
   1. Maintain room temperature at not less than 40 degrees F during application of gypsum board. Maintain room temperature at not less than 50 degrees F for, joint treatment, and decoration for 48 hours prior to and continuously thereafter until completely dry.
   2. Provide adequate ventilation during installation and curing period.
   3. Prevent exposure to excessive or continuous moisture before, during, and continuously after installation. Eliminate sources of moisture immediately.
   4. Protect gypsum board from direct exposure to rain, snow, sunlight, or excessive weather conditions.

PART 2 PRODUCTS

2.1 SUSTAINABLE BUILDING DESIGN REQUIREMENTS

A. Provide sealants that meet VOC requirements of South Coast Air Quality Management District (SCAQMD) Rule 1168. Information is available at www.aqmd.gov.

2.2 MANUFACTURERS

A. Acceptable Manufacturers:

1. USG – United States Gypsum Company, Chicago, IL 60606; toll free: 800-874-4968, phone: 312-606-4000, fax: 312-606-5566, www.usg.com.
2. National Gypsum Co., Charlotte, NC 28211; phone: 704-365-7300, fax: 800-329-6421, www.nationalgypsum.com.
3. GP-Gypsum – Georgia-Pacific Corp., Atlanta, GA; 800-824-7503, www.gp.com.
4. CertainTeed Corporation, Malvern, PA; toll free: 800-233-8990, www.certainteed.com.
5. PABCO Gypsum, Newark, CA 94560; phone: 510-792-9555, fax: 510-794-8725, www.pabcogypsum.paccoast.com.

B. Substitutions: Under provisions of Division 01.

2.3 GYPSUM BOARD

A. Type X Gypsum Board: ASTM C1396/1396M; 5/8-inch thick; 2.2 pounds per square foot; fire resistant core; maximum permissible length; ends square cut, tapered edges.

1. Acceptable Products:
   a. Sheetrock Brand Firecode X manufactured by USG,
   b. Gold Bond Brand XP Fire-Shield Gypsum Board manufactured by National Gypsum,
   c. ToughRock Fireguard manufactured by G-P Gypsum,
   d. CertainTeed Type X manufactured by CertainTeed Corporation,
   e. FLAME CURB Type X Gypsum Board manufactured by PABCO Gypsum,
   f. or accepted equal.

B. Moisture Resistant Gypsum Board: ASTM C1396/C1396M; 5/8 inch thick Type X, moisture and mold resistant core, encased in moisture resistant paper facers; maximum permissible length; ends square cut, tapered edges.

1. Average water absorption after two-hour immersion per ASTM C473: 5 percent or less.
2. Mold and mildew resistance per ASTM D3273: Minimum average score 8.
3. Acceptable Products:
   a. Sheetrock Brand Mold Tough Gypsum Panels manufactured by USG,
   b. Gold Bond Brand XP Gypsum Board manufactured by National Gypsum,
   c. ToughRock Mold Guard manufactured by G-P Gypsum,
   d. M2Tech Type X manufactured by CertainTeed Corporation,
   e. MOLD CURB PLUS Type X Mold and Water Resistant Gypsum Board manufactured by PABCO Gypsum,
   f. or accepted equal.

C. Hi-Impact Gypsum Wall System: 5/8 inch Type X, mold and moisture resistant per ASTM D3273, Level 3 surface abrasion resistance, Level 1 indentation resistance, Level 3 hard-body impact resistance, and Level 3 soft-body impact resistance per ASTM C1629.

1. Acceptable Systems:

a. US Gypsum Co.: Mold Tough VHI fire rated gypsum board panel. Also provide and install:

1) Imperial Veneer Basecoat.

2) Imperial Veneer Finish.

b. PABCO Gypsum: PABCO High Impact Type X Gypsum Board with two coats veneer plaster,

c. or accepted equal.

2.4 ACCESSORIES

A. Corner Bead, Edge Trim, and Decorative Dividers: ASTM C1047; zinc-coated sheet steel.

B. Control Joints: ASTM C1047; roll-formed zinc joint with removable protected opening; provided in accordance with UL fire rated assemblies. Acceptable product: Zinc Control Joint No. 093 manufactured by Clark Dietrich, or accepted equal.

C. Screws:

1. ASTM C1002, Type S or Type A; bugle head; self-drilling and self-tapping screws for light gauge steel framing (less than 0.033 inch thick).

2. ASTM C954; bugle head; self-drilling and self-tapping screws for heavy gauge steel framing (0.033 inch to 0.112 inch thick).

D. Jointing Tape: ASTM C475/C475M; 2 inch wide heavy duty paper joint tape.

E. Joint Compound: ASTM C475/C475M.

F. Primer-Surfacer (used in lieu of skim coat in a Level 5 finish): High-build interior coating finish applied with an airless sprayer. Products: Sheetrock Brand Primer-Surfacer Tuff-Hide manufactured by USG, ProForm Brand Surfacer/Primer manufactured by National Gypsum, or accepted equal. Note: Walls applied with primer-surfacer do not require drywall paint primer prior to application of finish coats.

G. Acoustical Sealant: Refer to Section 07 92 00.

H. Firestop Putty Pads for Electrical Boxes: Intumescent moldable firestop putty pad. Acceptable products: SSP4S 7.25 inches by 7.25 inches or SSP9S 9 inches by 9 inches manufactured by Specified Technologies Inc. (STI), Somerville, NJ; 800-992-1180, www.stifirestop.com, or accepted equal.

I. Security Lath (Metal Mesh): 0.070 inch thick flattened expanded carbon steel mesh with 57 percent open area; pre-galvanized high strength low alloy (HSLA) meets or exceeds ASTM F1267 Type II, Class 1; 0.500 inch by 1.260 inch diamond openings; 1.40 pounds per square foot. Acceptable product: No. ASM .50-13F manufactured by Amico – Alabama Metal Industries Corporation (toll free: 800.366.2642; phone: 205.787.2611; URL: http://www.amico-securityproducts.com), or accepted equal.

1. Construction: Made from sheet steel that is simultaneously slit and stretched into a rigid open diamond mesh making one continuous sheet that cannot unravel.

2. Fastening system - Secura Clips as manufactured by Amico attached with a flat head bugle type self-tapping screw long enough to penetrate the steel stud at least 3/8 inch.
3. Closure strip – Amico two-piece Secura Lath Closure Strip.

2.5 GYPSUM SHEATHING

A. ASTM C1177/C1177M, glass mat-faced; or ASTM C1278/C1278M, fiber reinforced; water-resistant treated gypsum core; 5/8-inch thick Type X.
   1. Acceptable Products:
      a. DensGlass Fireguard Sheathing manufactured by GP-Gypsum,
      b. SecuRock Brand Glass-Mat Sheathing manufactured by USG,
      c. Gold Bond Brand e²XP Extended Exposure Sheathing manufactured by National Gypsum Co.,
      d. GlasRoc Sheathing manufactured by CertainTeed Corporation,
      e. PABCO GLASS Type X Sheathing manufactured by PABCO Gypsum.
      f. or accepted equal.

B. Screws: ASTM C954, bugle head fine thread, #6 minimum, corrosion resistant treated, self-drilling and self-tapping screws for heavy gauge steel framing (0.033 inch to 0.112 inch thick).

2.6 CEMENTITIOUS BACKER BOARD

A. Cement Board: ANSI A118.9 and ASTM C1325; polymer-modified cementitious board, with alkali-resistant fiberglass mesh reinforcing facers (front and back); long edges wrapped.
   1. Thickness: 5/8 inch.
   2. Acceptable Products:
      a. Durock Brand Cement Board with Edgeguard by United States Gypsum Co.,
      b. PermaBase Brand Cement Board by National Gypsum Co.,
      c. or accepted equal.

B. Accessories:
   1. Screws: No. 6 gauge by sufficient length to penetrate 3/8 inch into steel framing, self-drilling, ribbed wafer head screws or ribbed bugle head screws; minimum 500 hour corrosion resistant finish per ASTM B117.
   2. Jointing Tape: Alkali-resistant fiberglass mesh tape; 2 inches wide.
   3. Bonding and Jointing Materials: ANSI A118.1, dry-set Portland cement mortar; or ANSI A118.4, polymer modified latex Portland cement mortar.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine job site conditions and verify field dimensions.

B. Verify framing for acceptable placement, spacing, and tolerance (alignment and plumb).

C. Verify that framing and furring are securely attached.

D. Verify that all blocking, headers, and supports are in place to support plumbing fixtures, casework, grab bars, towel racks, shelves, and similar items.

E. Verify that insulation is secured.

F. Verify firestopping work, refer to Section 07 84 00.

G. Report unacceptable conditions to the Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 FIRESTOPPING AND SEALANTS

A. Install intumescent moldable pads over backs and sides of all electrical junction and utility boxes at fire rated walls.

B. Apply acoustical sealant at partitions per sealant manufacturer's instructions. Refer to Section 07 92 00.

3.3 GYPSUM BOARD INSTALLATION

A. Install gypsum board to framing and furring members in accordance with manufacturer's recommendations, GA-216 or ASTM C840, and as specified in this Section.

B. Install gypsum board with separate panels in moderate contact, do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints.

C. Install gypsum board in most economical direction, using maximum practical lengths, with edges occurring over firm bearing. Install 1/4 inch (nominal) above rough floor or curb. Cut out gypsum board as required to make neat close joints around openings.

D. In vertical applications, provide lengths required to reach full height of vertical surfaces in one continuous piece.

E. Where gypsum board is carried full height to structure above, provide for deflection of structure by undercutting board 3/8 inch (nominal) and sealing top edge of board to substrate with a continuous bead of sealant to form an elastic closure.

F. Use screws to fasten gypsum board to framing.

G. Treat cut edges and holes in moisture resistant gypsum board per manufacturer's recommendations.

H. Place corner beads at all exterior corners. Use longest practical length. Place edge trims where gypsum board abuts dissimilar materials.

I. Control Joints: Install control joints where indicated on the Drawings. Where not specifically indicated, install consistent with lines of building spaces as directed by Architect; and as a minimum, install as follows:

1. Where a partition, wall, or ceiling traverses a construction joint (expansion, seismic, or building control element) in the base building structure.
2. Where a wall or partition runs in an uninterrupted straight plane exceeding 30 linear feet.
3. In interior ceilings without perimeter relief so that linear dimensions between control joints do not exceed 30 feet and total area between control joints does not exceed 900 square feet.
4. Where ceiling framing members change direction.
5. Where a partition transitions from floor-supported framing to overhead hung framing.

J. Attach metal corner beads, edge trim, decorative dividers, and control joints to the supporting construction at 9 inches on center maximum spacing using same fasteners used to attach gypsum board panels.

3.4 FIRE-RESISTANT ASSEMBLIES

A. Install fire rated assemblies using materials, application methods including gypsum panel orientation, types and spacing of fasteners, and framing in accordance with the specified UL Fire Resistive Design Number, GA-600 File Number, or CBC Table 721.1.

B. Completely seal joints of fire-rated gypsum board enclosures in accordance with UL or GA listed assembly requirements. Seal penetrations through rated partitions and ceilings in accordance with tested systems. Refer to Section 07 84 00.

3.5 GYPSUM SHEATHING INSTALLATION

A. Install gypsum sheathing in accordance with GA-253, ASTM C1280, and manufacturer's instructions.

B. End joints, if required should be offset; joints should fit snugly and flashing installed around all openings.

C. Install maximum lengths possible to minimize number of joints. Edge joints must be centered over framing members and located parallel to and with vertical orientation on framing. Fit panels closely together, but do not force together. End joints of adjacent lengths of sheathing must be staggered.

D. Attach gypsum sheathing to frame with screws. Drive fasteners so as to bear tight against and flush with surface of sheathing. Do not countersink fasteners or break the glass mat. Fasten the panel to framing, working from the center of the panel toward the edges and ends. Fasteners must be located at least 3/8 inches from edges and ends of sheathing panels.

E. Holes for pipe penetrations, fixtures, or other small openings shall be scored or saw cut from the face side of the panels before removing the cutout.

F. Do not leave exposed surfaces of gypsum sheathing unprotected beyond the manufacturer's recommendation without a weather barrier cladding.

3.6 CEMENTITIOUS BACKER BOARD INSTALLATION

A. Install cementitious backer boards in accordance with ANSI A108.11 and manufacturer's instructions.

B. Place and fasten boards per manufacturer's instructions.

C. Apply boards with ends and edges closely butted but not forced together. Center end or edge joints on framing and stagger joints in adjacent rows.

D. Fasten boards to framing using specified fasteners. Drive fasteners into field of board first, working toward ends and edges. Hold boards in firm contact with framing while driving fasteners. Space fasteners maximum 8 inches on center with perimeter fasteners at least 3/8 inch from ends and 5/8 inch from edges.

E. Drive screws so bottoms of heads are flush with surface of boards to provide firm panel contact with framing. Do not overdrive screws and replace any screws that are stripped.

F. Provide additional blocking where required to permit proper attachment. Edges or ends of unit parallel to framing shall be continuously supported.

3.7 JOINT TREATMENT AND FINISH

A. Finish gypsum board surfaces in accordance with ASTM C840, GA-214, and GA-216.

B. Remove dirt, oil, and other materials that may cause lack of bond from all surfaces to receive joint compound.

C. Set mechanical fasteners below the plane of the board.

D. Tape, fill, and sand all joints, edges and corners to produce smooth surface ready to receive finishes. Fill all dents, gouges, recesses, or other depressions with joint compound to produce a monolithic surface.

E. Feather coats onto adjoining surfaces so that camber is maximum 1/32-inch.

F. Levels of Finish: Finish gypsum board surfaces in accordance with GA-214 as follows:

Area	Finish
Plenum areas above ceilings.	Level 1 finish, no texture.
Standard and moisture resistant gypsum backing board (substrate for adhesive applied finish material).	Level 2 finish, no texture.
Electrical and mechanical rooms.	Level 3 finish, no texture.
FRP wall covering.	Level 3 finish, no texture.
Smooth finish; satin/eggshell paint finish.	Level 4 finish. Level 5 finish where critical (severe) lighting condition occurs (refer to GA-214 for description of critical lighting).
Smooth finish; semi-gloss paint finish.	Level 5 finish.

3.8 TOLERANCES

A. Maximum variation from true flatness: 1/4 inch in 10 feet in any direction.

B. Maximum surface variation of substrate for walls to receive ceramic tile: Refer to Section 09 30 00.

3.9 CLEANING AND PROTECTION

A. Cleaning and Repair: Clean surfaces that have been spotted or soiled during wallboard application.

B. Defective Work: Remove and replace defective work that cannot be satisfactorily repaired, at the direction of the Architect, with no additional cost to the Owner.

C. Protection: Protect installed work against damage from other construction work.

D. Upon completion of the work under this Section, remove all surplus material, rubbish and debris from the premises and leave floors broom clean.

END OF SECTION

SECTION 09 30 00

TILING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ceramic tile.

B. Setting materials including adhesives and mortar.

C. Tile grout.

D. Sealants.

E. Membranes:
   1. Crack isolation.
   2. Waterproofing.

F. Accessories.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 04 22 00 – Concrete Unit Masonry.

C. Section 07 92 00 – Joint Sealants.

D. Section 09 29 00 – Gypsum Board.

E. Section 10 28 13 – Toilet Accessories.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards and Manuals:
   1. ANSI A108.1B – Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar.
   2. ANSI A108.5 – Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
   3. ANSI A108.6 – Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy.
   4. ANSI A108.11 – Interior Installation of Cementitious Backer Units.

5. ANSI A108.13 – Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.
6. ANSI A108.17 – Installation of Crack Isolation Membranes.
7. ANSI A118.3 – Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive.
8. ANSI A118.4 – Latex-Portland Cement Mortar.
9. ANSI A118.10 – Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installations.
10. ANSI A118.12 – American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.
11. ANSI A137.1 – Ceramic Tile.
12. ASTM A82 – Standard Specifications for Steel Wire, Plain, for Concrete Reinforcement.
13. ASTM A185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
14. ASTM C144 – Standard Specification for Aggregate for Masonry Mortar.
15. ASTM C150 – Standard Specification for Portland Cement.
16. ASTM C206 – Standard Specification for Finishing Hydrated Lime.
17. ASTM C207 – Standard Specification for Hydrated Lime for Masonry Purposes.
18. ASTM C373 – Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products.
19. ASTM C648 – Standard Test Method for Breaking Strength of Ceramic Tile.
20. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
21. ASTM C1027 – Standard Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile.
22. MIA Design Manual.
23. TCNA Handbook for Ceramic, Glass, and Stone Tile Installation by Tile Council of North America, Inc.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Submit product data indicating material specifications and characteristics.

C. Submit instructions for installing membranes, adhesives, and grouts.

D. Samples: Submit two samples of each type and color of ceramic tile and trim.

E. Closeout Submittals: Cleaning and maintenance data.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section with a minimum ten years' experience.
2. Installer Qualifications: Firm specializing in installing work specified in this Section acceptable to manufacturer with experience on at least five projects of similar nature in past three years.

B. Single Source Responsibility: Provide setting, grouting, membrane, and sealant products from a single manufacturer to ensure system compatibility and quality, and to comply with manufacturer's warranty requirements.

C. Perform work in accordance with TCNA Handbook for Ceramic Tile Installation and ANSI A108 Series. Provide a copy of TCNA Handbook for Ceramic Tile Installation and ANSI A108 Series at the job site.

D. Pre-Installation Meetings:

1. Conduct pre-installation meeting in accordance with Division 01.
2. Convene pre-installation meeting prior to commencing work of this Section.
3. Coordinate work in this Section with work in related Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Storage and Protection: Store materials in a dry secure place. Protect from weather, surface contaminants, corrosion, construction traffic, and other potential damage. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Perform ceramic tile work when the ambient temperature is at least 50 degrees F and rising. Maintain temperature above 50 degrees F while the work is being performed for at least seven days after completion of the work.

B. Do not install adhesives in a closed, unventilated environment.

1.8 WARRANTY

A. Comply with provisions of Division 01.

B. Provide manufacturer's standard performance warranties that extend beyond a one-year period.

1.9 MAINTENANCE

A. Extra Materials: Provide five percent extra of the total square footage of each type and color of tile installed. Comply with provisions of Division 01.

B. Operation and Maintenance Data: Submit cleaning and maintenance data in accordance with Division 01.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers - Tile:
   1. Daltile Corp., Dallas, TX; (800) 933-8453, www.daltile.com.
   2. American Olean Tile Co., Dallas, TX; (888) 268-8453, www.aotile.com.
   3. Crossville Inc., Crossville, TN; (931) 484-2110, www.crossvilleinc.com.
   4. Interceramic, Garland, TX; (800) 688-5671, www.interceramic.com.
   5. Emser Tile, Los Angeles, CA; (323) 650-2000, www.emser.com.

B. Acceptable Manufacturers - Setting Materials:
   1. Custom Building Products, Seal Beach, CA; (209) 518-1153, www.custombuildingproducts.com.
   2. Laticrete International, Inc., Bethany, CT; (800) 243-4788, www.laticrete.com.
   3. Mapei Corp., Deerfield Beach, FL; (800) 426-2734, www.mapei.com.

C. Acceptable Manufacturers - Grout:
   1. Custom Building Products.
   2. Laticrete International, Inc.
   3. Mapei Corp.

D. Acceptable Manufacturers - Sealants:
   1. Custom Building Products.
   2. Laticrete International, Inc.
   3. Mapei Corp.
   4. Color Caulk, Inc.

E. Acceptable Manufacturers - Crack Isolation and Waterproofing Membranes:
   1. Custom Building Products.
   2. Laticrete International, Inc.
   3. Mapei Corp.

F. Acceptable Manufacturers - Accessories:
   1. Schlüter-Systems L.P., Plattsburgh, NY; (800) 472-4588, www.schluter.com.
   2. Custom Building Products, Seal Beach, CA; (209) 518-1153, www.custombuildingproducts.com.

G. Substitutions: Under provisions of Division 01.

2.2 CERAMIC TILE

A. General: ANSI A137.1, Standard Grade. Packaging shall be grade sealed. Seals shall be marked to correspond with the marks on the signed master grade certificate.

B. Properties:
   1. Impact resistant with a minimum breaking strength of 90 pounds for wall tiles and 250 pounds for floor tiles in accordance with ASTM C648.
   2. Water absorption shall be 0.50 percent maximum in accordance with ASTM C373.
   3. Tile flooring shall be stable, firm, and slip resistant per CBC Section 11B-302.1. Floor tiles shall have a minimum dynamic coefficient of friction of 0.42 wet in accordance with the DCOF AcuTest.
   4. Floor tiles shall be minimum Class IV – Heavy Traffic durability when tested in accordance with ASTM C1027 for abrasion resistance as related to foot traffic.

C. Products:
   1. Porcelain Floor Tiles (CT-1): Daltile Corp., Slate Attache Series.
      a. Nominal Size: 12 inches by 24 inches.
      b. Thickness: 5/16 inch.
      c. Surface Finish: Matte.
      d. Color: As indicated on Drawings.
   2. Porcelain Wall Tiles (CT-2 and CT-5): Daltile Corp., Wanderwise Series.
      a. Nominal Size: 12 inches by 24 inches.
      b. Thickness: 5/16 inch.
      c. Surface Finish: Matte.
      d. Color: As indicated on Drawings.
   3. Porcelain Wall Tiles (CT-6): Daltile Corp., Wanderwise Series.
      a. Nominal Size: Plank, 6 inches by 24 inches.
      b. Thickness: 5/16 inch.
      c. Surface Finish: Matte.
      d. Color: As indicated on Drawings.
   4. Porcelain Mosaic Floor Tiles (CT-3): Daltile Corp., Slate Attache Series.
      a. Nominal Size: 2 inches by 2 inches.
      b. Thickness: 1/4 inch.
      c. Surface Finish: Matte.
      d. Color: As indicated on Drawings.
   5. Quarry Floor Tile (CT-4): Daltile Corp., Quarry Textures.
      a. Nominal Size: 8 inches by 8 inches.
      b. Thickness: 1/2 inch.
      c. Surface Finish: Abrasive.
      d. Color: As indicated on Drawings.
   6. Porcelain Base Tiles (B3): Daltile Corp., Wanderwise Series.
      a. Nominal Size: 6 inches by 12 inches.
      b. Color: As indicated on Drawings.

7. Quarry Base Tiles (B4): Daltile Corp., Quarry Textures.
    a. Nominal Size: 5 inches by 8 inches.
    b. Color: As indicated on Drawings.

D. Special Shapes (trimmers, angles, bases, caps, stops, and returns): Same nominal size as field tile; rounded concave and convex surfaces; same properties as field tile (moisture absorption, surface finish, and color). Provide radius at all outside vertical and horizontal corner tile. Provide base at wall tile.

E. Wall Base: Unless otherwise indicated, wall base shall be 6 inches high with 3/8 inch minimum cove radius.

2.3 SETTING MATERIALS

A. Latex Portland Cement Mortar: Prepackaged, one-part, high performance, latex polymer modified dry-set, thin-set mortar. Meets or exceeds ANSI A118.4.
    1. Products:
        a. Custom Building Products MegaLite Crack Prevention Mortar.
        b. Laticrete 254 Platinum Multipurpose Thin-Set Mortar.
        c. Mapei Ultraflex 3.
        d. Or accepted equal.

B. Latex Portland Cement Mortar for Large Format Tile: Prepackaged, one-part, high performance, latex polymer modified dry-set, thin-set mortar. Meets or exceeds ANSI A118.4.
    1. Products:
        a. Custom Building Products ProLite Tile & Stone Mortar.
        b. Laticrete 4-XLT.
        c. Mapei Ultraflex LFT.
        d. Or accepted equal.

C. Mortar Bed:
    1. Materials:
        a. Cement: Portland cement, ASTM C150 Type I.
        b. Aggregate: ASTM C144, clean, graded, and passes a 16-mesh screen.
        c. Hydrated Lime: ASTM C206, Type S or ASTM C207, Type S.
        d. Water: Clean and potable.
    2. Mortar Mix: Comply with ANSI A108.1A Section A-4.1a.2.

2.4 GROUTING MATERIALS

A. Epoxy Grout: 100 percent solids epoxy grout; stainless, non-sagging, water cleanable; conforming to ANSI A118.3.
    1. Products:
        a. Custom Building Products CEGLite Commercial Epoxy Grout.
        b. Laticrete Spectralock Pro Premium.

c. Mapei Kerapoxy IEG CQ.

d. Or accepted equal.

2. Colors as selected by Architect.

2.5 SEALANTS

A. Latex siliconized sealant, non-sanded, in conformance with ASTM C920, Type S, Grade NS, Class 25, Uses NT, M and G. Color to match grout color.

1. Products:

a. Custom Building Products 100% Silicone Commercial Caulk.

b. Laticrete Latasil.

c. Mapei Keracaulk.

d. Color Caulk, Inc. Latex Siliconized Sealant.

e. Or accepted equal.

B. Sealants shall comply with regulations of South Coast Air Quality Management District Rule 1168 for VOCs.

2.6 MEMBRANES

A. Crack Isolation Membrane: Trowel applied or self-adhering sheet membrane; load bearing; bonded; conforming to ANSI A118.12.

1. Products:

a. Custom Building Products Fracture Free.

b. Laticrete Blue 92.

c. Mapei Mapelastic 2, Crack Isolation Membrane, flexible thin, 40-mil lightweight, load-bearing, fabric-reinforced “peel-and-stick” crack-isolation membrane.

d. Or accepted equal.

B. Waterproofing Membrane: Trowel applied, liquid, load bearing; bonded; conforming to ANSI A118.10.

1. Products:

a. Custom Building Products Custom 9240 Waterproofing and Crack Prevention Membrane. Self-curing liquid elastomeric membrane with reinforcing fabric.

b. Laticrete 9235 Waterproofing Membrane with Microban. Self-curing liquid elastomeric membrane with reinforcing fabric forming a flexible, seamless waterproof membrane bonded to the substrate. Contains an antimicrobial protection to inhibit growth of mold and mildew.

c. Mapei Mapelastic 400, premixed, flexible, thin, ultra fast-drying waterproofing membrane.

d. Or accepted equal.

2.7 ACCESSORIES

A. Mortar Bed Reinforcing Mesh: ASTM A82 and ASTM A185; galvanized welded wire fabric; 16 gauge wire; 2 inch by 2 inch mesh.

B. Expansion Joints: DILEX-AKWS surface joint profile with aluminum anchoring legs and 1/4 inch wide PVC movement zone manufactured by Schlüter-Systems L.P., Custom Building Products, or accepted equal. PVC color as selected by Architect from manufacturer's full range of standard colors.

C. Edge Trim: SCHIENE type 304 stainless steel edge trim manufactured by Schlüter-Systems L.P., Custom Building Products, or accepted equal.

D. Cove Base: DILEX-AHK 1S 125 AE anodized aluminum cove base manufactured by Schlüter-Systems L.P., Custom Building Products, or accepted equal.

1. Provide matching inside corners, outside corners, connectors, and end caps as required.

E. Corner Trim: FINEC-F 125 E 1/2 inch square edge type 304 stainless steel corner trim manufactured by Schlüter-Systems L.P., Custom Building Products, or accepted equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine job site conditions and verify field dimensions. Verify substrate is plumb, level, true to line and square.

B. Substrate surface conditions shall conform to the requirements of ANSI A108 for the type of substrate specified and for workmanship.

C. Maximum surface variation of substrate shall not exceed maximum limits as specified in specific TCNA Methods or as follows, whichever is more stringent.

Type	Walls	Floors
Latex Portland Cement Mortar	1/8 inch in 8 feet	1/8 inch in 10 feet
Mortar Bed	Not Applicable	1/4 inch in 10 feet

D. Tile work shall not be started until roughing in for mechanical and electrical work has been completed and tested, and built-in items requiring waterproofing membrane have been installed and tested.

E. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Install in accordance with TCNA Handbook for Ceramic Tile Installation and ANSI A108.
2. Install crack isolation and waterproofing membranes per manufacturer's recommendations.
3. Do not interrupt tile pattern through openings.
4. In areas requiring floor and wall tiles, floor tile installation shall not begin until after wall tiles have been installed.
5. Where tiles of different thicknesses are installed adjacent to each other in the same plane, the finished faces shall be flush with each other.

6. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align floor, base and wall joints.
7. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar or excess grout.
8. Provide grout joint spacing in accordance with tile manufacturer's recommendations.
9. Install movement joints where indicated on Drawings and as specified in this Section.
10. Install accessories per manufacturer's recommendations and as detailed on Drawings.
11. Sound tile after setting. Replace hollow sounding units.
12. Allow tile to set prior to grouting: Minimum of 48 hours for thin-set methods and 78 hours for mortar bed methods.

B. Installation Methods – Interior Walls:

Method	Substrate/Application	Setting Material
TCNA Method W202I, ANSI A108.5, and A108.6.	Masonry; thin set application; epoxy grout.	Latex Portland cement mortar.
TCNA Method W243, ANSI A108.5, and A108.6.	Moisture resistant gypsum board; thin set application; epoxy grout.	Latex Portland cement mortar.

C. Installation Methods – Interior Floors:

Method	Substrate/Application	Setting Material
TCNA Method F125-Full; ANSI A108.5, A108.6, and A108.17.	On-ground concrete; crack isolation membrane; thin set application; epoxy grout.	Latex Portland cement mortar.

D. Installation Methods – Shower Receptors:

Method	Substrate/Application	Setting Material
TCNA Method B415 with W244C, ANSI A108.5, A108.6, A108.11, and A108.13.	Wall – Cementitious backer board; bonded waterproofing membrane; thinset application; epoxy grout. Floor – Concrete slab-on-grade and mortar bed with bonded waterproofing membrane; thinset application; epoxy grout.	Wall and Floor: Latex Portland cement mortar.

3.3 JOINTS

A. Joint Widths at Walls and Floors: Install tile on walls and floors in the joint widths recommended by the tile manufacturer.

B. Expansion Joints:

1. Provide expansion joints at locations shown on the Drawings or where Drawings do not indicate location, provide in the following locations as a minimum requirement:
   a. Provide and install expansion joints per TCNA EJ171.
   b. At control joints and expansion joints in substrate material,

c. Where substrate material changes to separate different materials,

d. Over construction joints,

e. Where tile abuts restraining surfaces, such as perimeter walls, curbs, and columns and at intervals of 24 to 36 feet each way in interior floor areas.

2. Expansion joints shall extend through setting-beds and fill.

3.4 INSTALLATION - GROUT

A. Epoxy Grout: Install in accordance with manufacturer's printed instructions and ANSI A108.6.

1. Before grouting, ensure all tiles are firmly in place. Clean tile surfaces; remove paper and glue from face of mounted tiles. Remove spacers, strings, ropes, and pegs.
2. Clean open tile joints. Remove excess setting materials present in the open grout joints.
3. Mix grout in accordance with manufacturer's instructions.
4. Apply grout firmly into open joints using a hard rubber float.
5. Remove all excess epoxy grout from the tile surface with a rubber squeegee or rubber trowel before it loses plasticity and begins to set.
6. Immediately perform final clean up in accordance with manufacturer's instructions.

3.5 CLEANING AND PROTECTING

A. Clean as recommended by manufacturer. Do not use materials or methods which may damage finish surface or surrounding construction.

B. Provide protective covering as recommended by tile manufacturer and as required to ensure installed tile finish will not be damaged by work of other trades. Protect installed tile finish surfaces from damage until Project Completion.

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Lay-in acoustical panels.

C. Accessories.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 05 12 00 – Structural Steel Framing.

C. Section 05 31 00 – Steel Decking.

D. Section 09 29 00 – Gypsum Board.

E. Section 09 51 23 – Acoustical Tile Ceilings.

F. Divisions 21 – 23 – Mechanical.

G. Divisions 26 – 28 – Electrical.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASCE 7-16 – Minimum Design Loads for Buildings and Other Structures.
2. ASTM A641/A641M – Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
3. ASTM C635 – Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
4. ASTM C636 – Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
5. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
6. ASTM E580 – Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Subject to Earthquake Ground Motions.

7. ASTM E1264 – Standard Classification for Acoustical Ceiling Products.
8. UL Fire Resistance Directory and Building Material Directory.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data: Provide data on metal grid system components, compression struts, and acoustical units.

C. Samples:

1. Submit two samples, 6 inch by 12 inch in size, illustrating material and finish of each type of acoustical panel specified.
2. Submit two samples each, 12 inch long, of suspension system main runner, cross runner and edge trim in specified color.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.5 SYSTEM DESCRIPTION

A. Performance Requirements: Rigidly secure suspended acoustical ceiling system, including integral mechanical and electrical components with maximum deflection of 1/360.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Metal Suspension Grid Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section with a minimum ten years' experience.
2. Lay-in Acoustical Tile Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section with a minimum ten years' experience.

B. Single Source Responsibility: Provide metal suspension systems and lay-in acoustical panels from a single manufacturer to ensure system compatibility and quality, and to comply with manufacturer's warranty requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Storage and Protection: Store materials in a dry secure place. Protect from weather, surface contaminants, construction traffic, and other potential damage.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Maintain 60 degrees F minimum uniform temperature and 20 percent to 40 percent relative humidity prior to, during, and after installation of acoustical lay-in tiles.

1.9 SUSTAINABLE DESIGN REQUIREMENTS

A. Ceiling panel products shall meet the requirements of the California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Version 1.2, January 2017 (Emission testing method for California Specification 01350).

1.10 SEQUENCING

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust-generating activities have terminated and overhead work is completed, tested and approved.

B. Install acoustical units after interior wet work is dry.

1.11 MAINTENANCE

A. Extra Materials:

1. Furnish in accordance with Division 01.
2. Provide ten percent extra of each type of panel.

1.12 WARRANTIES

A. Metal Suspension Systems: Suspension system shall be warranted to be free from defects in materials or factory workmanship and warranted against the occurrence of 50 percent red rust as designated by ASTM D610 test procedures for a period of ten years from the date of installation.

B. Acoustical Panels: Panels shall be warranted to be free from defects in materials or factory workmanship, or sagging and warping as a result thereof, for one year from the date of installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers – Metal Suspension Systems:

1. Armstrong World Industries, Inc., Lancaster, PA 17603-3550; phone: 888.234.5464; fax: 800.572.8324; URL: http://www.armstrong.com. Refer to ICC ESR-1308.
2. USG Interiors, Inc., Chicago, IL 60606-4678; phone: 800.950.3839; fax: 312.606.4093; URL: http://www.usg.com. Refer to ICC ESR-1222.
3. CertainTeed Corporation, Malvern, PA; 800-233-8990, www.certainteed.com. Refer to ICC ESR-3336

B. Acceptable Manufacturers – Lay-in Acoustical Panels:

1. Armstrong World Industries, Inc.
2. USG Interiors, Inc.
3. CertainTeed Corporation

C. Substitutions: Under provisions of Division 01.

2.2 METAL SUSPENSION SYSTEM

A. Metal Suspension Grid: ASTM C635, heavy duty classification in compliance with ASCE 7-16 13.5.6.2.2 (a); hot-dipped galvanized steel (minimum G30); 15/16 inch face; structural tee main and cross members; capped with steel, coated with factory applied baked-on white enamel paint.

1. Main runners, cross runners, splices, expansion devices, and intersection connectors shall be designed to carry a mean ultimate test load of not less than 180 pounds in compression and tension per ASTM E580.

B. Products, Suspension System:

	Main Runner	Cross Tees
1. Armstrong Prelude XL	7301	XL7342 and XL7328
2. USG Donn DX	DX26	DX424 and DX216
3. CertainTeed Seismicsecure Classic Stab	CS12-12-15	CS2-12-12 and CS4-12-12

C. Products, Suspension System Accessories:

	Wall Angle	Seismic Clip at Wall Angle
1. Armstrong	7800	BERC2
2. USG Donn	M7	ACM7
3. CertainTeed	WA15-15	CTSPC-2

2.3 ACCESSORIES – METAL SUSPENSION SYSTEM

A. Metal suspension system accessories as required for a complete system including but not limited to moldings, stabilizer bars, splices, hold down clips, and light fixture clips.

B. Wire Hangers: ASTM A641/A641M, zinc-coated wire, Class 1, soft temper, pre-stretched, with a yield stress of at least three times the design load; sizes and gauges as shown on the Drawings and as specified in this Section.

C. Support channels and hangers: Galvanized primed steel (minimum G30); size and type to suit application and to meet seismic requirements and as specified in this Section.

D. Seismic Isolation Joints:

1. Acceptable Manufacturers:
   a. Balco. Product: AC Accordian Acoustical Ceiling with 100% movement.
   b. MM Systems.
   c. Watson Bowman Acme.
   d. InPro Corporation.
   e. Substitutions: Under provisions of Division 01.

2. Materials:
    a. Variable extruded white Santoprene seal fixed between two extruded aluminum frames. Seal shall allow 100 percent expansion/contraction movement and 100 percent vertical shear movement in conformance with ASTM E1399. Color as selected by Architect.

2.4 ACOUSTICAL LAY-IN PANELS

A. Panel Type 1 (CL3):
1. ASTM E1264, Type III, Form 2; Pattern C E.
2. Material: Wet-formed mineral fiber with factory-applied latex paint finish.
3. Properties:
    a. Color: White.
    b. Light Reflectance: Minimum 0.82.
    c. NRC: Minimum 0.55.
    d. Fire Resistance: CBC Class A (NFPA Class A); Flame Spread: 25 or under; Smoke Developed: 50 or under per ASTM E84.
4. Products:

	Size (ft x ft x in thick)	Edge
Armstrong Fine Fissured, No. 1729	2 x 4 x 5/8	Square
USG Radar, No. 2410	2 x 4 x 5/8	Square
CertainTeed Fine Fissured, No. HHF-197	2 x 4 x 5/8	Square

B. Panel Type 2 (CL5):
1. ASTM E1264, Type IX, Form 2; Pattern G.
2. Material: Wet-formed mineral fiber with factory-applied latex paint finish.
3. Properties:
    a. Color: White.
    b. Light Reflectance: Minimum 0.89.
    c. Fire Resistance: CBC Class A (NFPA Class A); Flame Spread: 25 or under; Smoke Developed: 50 or under per ASTM E84.
4. Products:

	Size (ft x ft x in thick)	Edge
Armstrong Kitchen Zone, No. 672	2 x 4 x 5/8	Square
USG Kitchen Lay-In, No. 3410	2 x 4 x 5/8	Square
CertainTeed Vinylrock, No. 1140-CRF-1	2 x 4 x 5/8	Square

C. Panel Type 3 (CL6):
1. ASTM E1264, Type IV, Form 2; Pattern E.
2. Material: Wet-formed mineral fiber with factory-applied acoustically transparent membrane and latex paint finish.

3. Properties:
   a. Color: White.
   b. Light Reflectance: Minimum 0.87.
   c. NRC: Minimum 0.80.
   d. Fire Resistance: CBC Class A (NFPA Class A); Flame Spread: 25 or under; Smoke Developed: 50 or under per ASTM E84.
4. Products:

	Size (ft x ft x in thick)	Edge
Armstrong Ultima High NRC, No. 1944	2 x 4 x 7/8	Beveled Tegular
USG Mars High NRC, No. 89600	2 x 4 x 7/8	Shadowline Tapered
CertainTeed Symphony M High NRC, No. 1220BB-80-1	2 x 4 x 7/8	Reveal

D. Accessories – Acoustical Lay-in Panels:
   1. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine job site conditions and verify field dimensions. Verify hangers will not interfere with other work.

3.2 INSTALLATION – SUSPENDED CEILING METAL GRID

A. Install in accordance with manufacturer's instructions, CBC Section 808, ASTM C635, ASTM C636, ASTM E580, ASCE 7 16 13.5.6.2.2, approved shop drawings, and as specified in this Section.

B. Install ceiling metal suspension system after major above ceiling work is complete. Coordinate location of hangers with other work.

C. Hang suspension system independent of walls, columns, ducts, cable trays, pipes, and conduits.

D. Use minimum 12 gauge hanger wires for up to and including four foot by four foot grid spacing attached to main runners.

E. Provide 12 gauge hanger wires at the perimeter ends of all main and cross runners within 8 inches of the support or within 1/4 of the length of the end tee, whichever is least. End connections for runners which are designed and detailed to resist the applied vertical and horizontal forces may be used in lieu of the 12 gauge hanger wires.

F. Provide trapeze or other supplementary support members at obstructions to typical hanger spacing. Provide additional hangers, struts or braces as required at all ceiling breaks, soffits, or discontinuous areas. Where hanger wires are more than one in six out of plumb, provide counter-sloping wires.

G. Ceiling grid members shall be attached to two adjacent walls, and at least 3/4 inch free of other walls. Where walls run diagonally to ceiling grid system runners, one end of main and cross runner should be free, and a minimum 3/4 inch clear of wall.

H. At ceiling perimeter area, where main or cross runners are not connected to adjacent walls, provide interconnection between runners at the free end to prevent lateral spreading. A metal strut or a 16 gauge wire with positive mechanical connection to the runner may be used. Interlock is not required where perpendicular distance from the wall to the first parallel runner is 8 inches or less.

I. Wall angles shall be positively attached to wall studs or blocking.

J. Seismic clips shall be attached to wall angles with a minimum of two screws, and shall be installed around the entire ceiling perimeter.

   1. Pop rivets may be used in lieu of seismic clips at fixed sides where permitted by Evaluation Report.

K. Expansion joints shall be provided in the ceiling at the intersections of corridors and at junctions of corridors and lobbies or other similar areas.

L. Where ceiling areas exceed 2500 square feet, a seismic separation joint shall be provided to divide the ceiling into areas not exceeding 2500 square feet. Alternatively, comply with ASTM E580.

M. Penetrations through the ceiling for fire sprinkler heads and other similar devices that are not integrally tied to the ceiling system in the lateral direction shall have a 2 inch oversized ring, sleeve, or adapter through the ceiling panel to allow free movement of 1 inch in all directions. Alternatively, a flexible fire sprinkler hose fitting that can accommodate 1 inch of ceiling movement per ASTM E580 may be used.

N. Provide bracing assemblies consisting of a compression strut and four 12 gauge splayed bracing wires oriented 90 degrees from each other. Splayed bracing wires shall be taut and shall not exceed 45 degrees from the ceiling plane. Splices in bracing wires are not permitted. Space bracing assemblies as follows:

   1. Not more than 1/2 of the spacing given above from the perimeter wall and at the edge of vertical ceiling offsets.

   2. Suspended acoustical ceiling systems with a ceiling area of 144 square feet or less surrounded by walls which connect directly to the structure above, do not require bracing assemblies when attached to two adjacent walls.

O. Compression struts shall be adequate to resist the vertical component induced by the bracing wires, and shall not be more than one horizontal in six vertical out of plumb.

P. Fasten hanger wires with not less than three tight turns in 3 inches. Fasten bracing wires with four tight turns in 1-1/2 inches. Install hanger or bracing wire anchors to the structure in a manner that the direction of the wire aligns as closely as possible to the direction of the forces acting on the wire.

Q. Separate all ceiling hanging and bracing wires at least 6 inches from all unbraced ducts, pipes, conduit, etc.

R. When drilled-in concrete anchors or shot-in anchors are used in reinforced concrete for hanger wires or when drilled-in concrete anchors are used in reinforced concrete for bracing wires, refer to Drawings for testing frequency and tension test load values. Shot-in anchors in concrete are not permitted for bracing wires. Refer to CBC Chapter 19 if any shot-in or drilled-in anchor fails.

1. Concrete Anchorage Requirements:

a. Anchorage to Concrete: Conform to requirements of CBC Chapter 19.

b. Tests for Post-Installed Anchors in Concrete: Conform to CBC Chapter 19.

S. Attach all light fixtures, ceiling mounted air terminals or services, light-weight miscellaneous devices, such as strobe lights, speakers, etc., and all other devices to the ceiling grid runners to resist a horizontal force equal to the weight of the fixtures. Screw or approved fasteners are required. A minimum of two attachments are required per ASTM E580.

1. Devices weighing more than ten pounds and twenty pounds or less shall have a 12 gauge slack safety wire anchored to the structure above.

T. Flush or recessed light fixtures, air terminals or services, and flexible fire sprinkler hose fittings weighing more than 20 pounds and less than 56 pounds, shall be supported directly on the runners of a heavy duty grid system. In addition, provide two 12 gauge slack safety wires attached to the fixture at diagonal corners and anchored to the structure above. Four foot by four foot light fixtures shall have slack safety wires at each corner.

U. Flush or recessed light fixtures, air terminals or services, and flexible fire sprinkler hose fittings weighing 56 pounds or more shall be independently supported by not less than four taut 12 gauge wires attached to the fixture and to the structure above. The four taut 12 gauge wires, including their attachment to the structure above must be capable of supporting four times the weight of the unit.

V. Surface-mounted fixtures shall be attached to the main runner with at least two positive clamping devices made of minimum 14 gauge material. Rotational spring catches are not allowed. A 12 gauge suspension wire shall be attached to each clamping device and be attached to the structure above. Provide additional supports when light fixtures are eight feet or longer. Maximum spacing between supports shall not exceed eight feet.

W. Support pendant mounted light fixtures directly from structure above with hanger wires or cables passing through each pendant hanger and capable of supporting two times the weight of the fixture. A bracing assembly is required where the pendant hanger penetrates the ceiling. Attach pendant hanger to bracing assembly in a manner to transmit horizontal force. Where the pendant mounted light fixture is directly and independently braced below the ceiling, such as with aircraft cables to walls, the brace assembly is not required above the ceiling.

X. Do not eccentrically load suspended ceiling grid system or produce rotation of runners.

Y. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners; provide edge moldings at junctions with other interruptions.

3.3 INSTALLATION – LAY-IN CEILING PANELS

A. Install units in accordance with manufacturer's instructions.

B. Fit units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Cut units to fit irregular grid and perimeter edge trim. Double cut and field paint exposed edges of tegular units in matching color.

D. Lay directional patterned units one way with pattern parallel to longest room axis. Fit border trim neatly against abutting surfaces.

E. Install units after above ceiling work is complete.

F. Install units level, in uniform plane, and free from twist, warp and dents.

G. Install hold-down clips to retain units tight to grid system within ten feet of all exterior doors and at all Dayroom ceilings.

3.4 ERECTION TOLERANCES

A. Maximum variation from flat and level surface: 1/8 inch in 10 feet.

B. Variation from plumb of grid members caused by eccentric loads: Two degrees maximum.

3.5 CLEANING

A. Clean as recommended by manufacturer. Do not use materials or methods which may damage finish surface or surrounding construction.

END OF SECTION

SECTION 09 51 23

ACOUSTICAL TILE CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Acoustical tile and perimeter trim.

1.2 RELATED SECTIONS

A. Section 09 29 00 – Gypsum Board.

B. Section 09 51 13 – Acoustical Panel Ceilings.

C. Divisions 21 – 23 – Mechanical.

D. Divisions 26 – 28 – Electrical.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM D1779 – Standard Specification for Adhesive for Acoustical Materials.
2. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
3. ASTM E1264 – Standard Classification for Acoustical Ceiling Products.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Provide data on acoustic units.

C. Samples: Submit two samples, 12 inches x 12 inches in size, illustrating material and finish of acoustic units.

1.5 QUALIFICATIONS

A. Acoustical Unit Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Applicator: Company specializing in performing the work of this section with documented experience.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain uniform temperature of minimum 60 degrees F and maximum humidity of 40 percent prior to, during, and after installation.

1.7 SUSTAINABLE DESIGN REQUIREMENTS

A. Ceiling tile products shall meet the requirements of the California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Version 1.2, January 2017 (Emission testing method for California Specification 01350).

1.8 SEQUENCING

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust-generating activities have terminated and overhead work is completed, tested and approved.

B. Install acoustic units after interior wet work is dry.

1.9 EXTRA MATERIALS

A. Furnish under provisions of Division 01.

B. Provide fifty square feet of extra tile to Owner.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Armstrong World Industries, Inc., Lancaster, PA; 888.234.5464; www.armstrong.com. Product: Fine Fissured #741.

B. USG Interiors, Inc., Chicago, IL; 800.950.3839; www.usg.com . Product: Radar #2570.

C. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Acoustic Tile, conforming to the following:

1. ASTM E1264, Type III, Form 2, Pattern C E.
2. Size: 12 inches x 12 inches.
3. Thickness: 1/2 inch minimum.
4. Composition: Wet-formed mineral fiber with factory-applied latex paint finish.
5. NRC: 0.55 minimum.
6. Light Reflectance: 0.82 minimum.
7. Fire Hazard Classification (ASTM E84): Class “A,” Flame Spread: 25; Smoke Developed: 50.
8. Edge: Beveled Tongue and Groove.
9. Surface Color: White.
10. Surface Finish: Non-directional.

B. Adhesive: ASTM D1779, waterproof, gun grade; type recommended by tile manufacturer.

C. Edge Trim: Rolled profile, hot-dipped galvanized steel (minimum G30); 5/8 inch face; coated with factory applied baked-on white enamel paint.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate conditions are ready to receive the work of this Section.

3.2 INSTALLATION

A. Install adhesive-applied system in accordance with manufacturer's instructions and as supplemented in this Section.

B. Install edge molding at intersection of ceiling and vertical surfaces, using maximum lengths. Miter corners. Provide edge moldings at junctions with other interruptions as indicated on drawings.

C. Center tile on room axis leaving equal border units.

D. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.

E. Fit border units neatly against abutting surfaces.

F. Install acoustical units level, in uniform plane, and free from twist, warp or dents.

3.3 ERECTION TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 54 26

LINEAR WOOD CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Linear wood ceiling panels.

B. Suspended metal grid ceiling system and perimeter trim.

C. Acoustical insulation over system units.

1.2 RELATED SECTIONS

A. Section 05 12 00 – Structural Steel Framing.

B. Section 05 31 00 – Steel Decking.

C. Division 21 – Sprinkler Systems: Sprinkler heads in ceiling system.

D. Division 23 – Air Outlets and Inlets: Air diffusers in ceiling system.

E. Division 26 – Interior Luminaries: Light fixtures in ceiling system.

F. Division 26 – Fire Alarm and Smoke Detection Systems: Smoke detectors in ceiling system.

G. Division 28 – Security Electronics.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM A446 – Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical Quality).
2. ASTM B209/B209M – Aluminum and Aluminum-Alloy Sheet and Plate.
3. ASTM B221/B221M – Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
4. ASTM A 653/A653M – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Allot-Coated (Galvanealed) by the Hot-Dip Process.
5. ASTM A666 – Austenitc Stainless Steel Sheet, Strip, Plate and Flat Bar.
6. ASTM C423 – Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberant Room Method.

7. ASTM C636 – Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
8. ASTM C665 – Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
9. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
10. ASTM E90 – Laboratory Measurement of Airborne-Sound Transmission Loss of Building Partitions.
11. ASTM E580 – Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Indicate ceiling system reflected plan, location of mechanical and electrical components, details of junction with dissimilar materials, and points of suspension.

C. Product Data: Provide component profiles, materials, perimeter and integral trim, and space closures.

D. Submit two samples 6 inches long, full width in size illustrating color and finish of exposed to view components.

1.5 DESIGN REQUIREMENTS

A. Design components to ensure light fixtures, and installed accessories, will not induce eccentric loads. Where components may induce rotation of ceiling system components, provide stabilizing reinforcement.

1.6 PERFORMANCE REQUIREMENTS

A. Installed Ceiling System: Exhibit maximum deflection of 1/360 of span.

B. Acoustic Attenuation: 0.70 NRC.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this Section.

B. Installer: Company specializing in performing the work of this section with sufficient documented experience approved by manufacturer.

C. Design suspension system for seismic considerations under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of California.

1.8 REGULATORY REQUIREMENTS

A. Conform to 2022 California Building Code for seismic requirements.

B. Composite Wood Products: Hardwood, plywood, particleboard, and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure (ATCM) for Composite Wood (17 CCR 93120 et seq.) Those materials not exempted under the ATCM must meet the specified emission limits, as shown in Table 5.504.4.5 of CALGreen.
   1. Documentation shall be provided per CALGreen Section 5.504.4.5.3.

1.9 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.10 COORDINATION

A. Coordinate work under appropriate provisions of Division 01.

B. Coordinate the work with installation of mechanical and electrical components.

1.11 MAINTENANCE MATERIALS

A. Provide maintenance materials under Division 01.

B. Provide ten percent of total standard lengths linear ceiling panels.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Rulon International. Product: Linear Open Suspended Wood Ceiling System with 6 inch modules.
   2. Architectural Surfaces, Inc.

B. Substitutions: Under provisions of Division 01.

2.2 WOOD BOARDS

A. 5-1/4 inch wide x 3/4 inch thick linear wood strips made from prime grade, all-natural Cherry or Beech, as selected by Architect.
   1. Texture shall be smooth-sawn with faces sanded.
   2. Cut: Quarter cut.
   3. Grade: AA Grade.
   4. Match between boards: Book match.
   5. Reveals: 3/4 inch reveals with factory-installed black fiberfelt spacer between the wood strips.
   6. Ends of boards at splices shall have tongue and groove configuration.

B. Fire Rating: UL Class A when tested according to ASTM E84.

C. Spacers: Black fiber felt factory-applied to one edge of each wood board.

2.3 COMPONENTS AND ACCESSORIES

A. Suspension Members: Formed steel sections, with integral attachment points; primed finish; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified. Suspension system shall be classified as heavy duty.

B. Subgirt Members: ASTM A446 Grade A, galvanized to 1.25 ounce per square foot zinc coating, formed structurally rigid to resist imposed loads, shaped to provide attachment for the finish panels and other accessories.

C. Leveling Splines: As supplied by linear wood ceiling manufacturer.

D. Attachment Clip: As supplied by linear wood ceiling manufacturer.

E. Hanger Wires: 12 gauge.

F. Acoustic Insulation: ASTM C665, preformed glass fiber roll; conforming to the following:

1. Black, Class A, no surface priming, 2 inches thick, 2 pounds per cubic foot density.

2.4 FINISHES

A. Factory Finish: Stained with lacquer topcoat in satin finish. Stain color to match Wilsonart high pressure plastic laminate color River Cherry, #3937-38.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine job site conditions and verify field dimensions. Verify hangers will not interfere with other work.

B. Verify that required utilities are available, in proper location, and ready for use.

3.2 INSTALLATION

A. Install work after above ceiling work is complete. Coordinate location of hangers with other work.

B. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

C. Suspension System: Install suspension system in accordance with manufacturer's instructions, ASTM C635, ASTM C636, ASTM E580, CBC Section 803.9, and as supplemented in this Section. Locate cliprails perpendicular to wood direction, 4 inches from one wall for the first cliprail, continuing 24 inches on center maximum, ending within 4 inches of the opposite wall. 12 gauge wire hangers shall be installed 4 feet on center along each cliprail. The wire hangers shall be attached to inserts, screw eyes, or other connecting devices that are secure and appropriate for suspending the ceiling and that will not deteriorate or fail with age or elevated temperatures.

1. Hang suspension system independent of walls, columns, ducts, light fixtures, pipe, and conduit. Where carrying members are spliced, avoid visible displacement of face panels with adjacent panels. Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest adjacent hangers to span the required distance.

2. HVAC and light fixture installations must be supported independently of the linera wood ceiling system.

D. Wood Strip Installation: Use the system manufacturer's clamping tool to snap wood strips onto cliprails. The clips, which are attached to the cliprail, have projections that insert into grooves cut into the back side of the wood strips. Proper tool adjustment is important to assure that the clips achieve a deep seat within the wood grooves. Installation shall proceed, in sequence, from one wall to the opposite side. Align end joints.

1. When installing linear open style ceilings with fiberfelt spacer, hang wood strips with felt edge facing the area yet to be filled.

E. Locate system according to reflected ceiling plan.

F. Butt interior end joints tight.

G. Exercise care when site cutting exposed finished components to ensure surface finish is not defaced.

H. Install edge moldings at intersection of ceiling and vertical surfaces using maximum lengths.

I. Field miter corners.

J. Provide edge moldings at junction with other finishes.

K. Provide end caps for linear panels exposed-to-view.

L. Install insulation above panel members; fit tight between grids members.

M. Provide expansion joints to accommodate ±1 inch movement and maintain visual closure.

3.3 ERECTION TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

C. Maximum Variation from Dimensioned Position: 1/4 inch.

3.4 CLEANING

A. Clean as recommended by manufacturer. Do not use materials or methods which may damage finish surface or surrounding construction.

B. Replace damaged or abraded components.

END OF SECTION

SECTION 09 65 00

RESILIENT FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Luxury vinyl tile flooring.

B. Biobased sheet flooring with integral cove base.

C. Resilient wall base, rubber.

D. Resilient molding accessories.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete; for concrete substrate.

B. Section 07 26 50 – Vapor Emission Control System.

C. Section 09 29 00 – Gypsum Board; for wall materials to receive resilient base.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
2. ASTM D2047 – Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.
3. ASTM D2240 – Standard Test Method for Rubber Property - Durometer Hardness.
4. ASTM D3389 – Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform Abrader).
5. ASTM E648 – Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
6. ASTM E662 – Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
7. ASTM F137 – Standard Test Method for Flexibility of Resilient Flooring Materials with Cylindrical Mandrel Apparatus.
8. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
9. ASTM F970 – Standard Test Method for Static Load Limit.

10. ASTM F1516 – Standard Practice for Sealing Seams of Resilient Flooring Products by the Heat Weld Method (when Recommended).
11. ASTM F1700 – Standard Specification for Solid Vinyl Floor Tile.
12. ASTM F1861 – Standard Specification for Resilient Wall Base.
13. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
14. NFPA 253 – Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
15. NFPA 258 – Recommended Practice for Determining Smoke Generation of Solid Materials.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Submit seaming layouts for all sheet flooring products specified.

C. Provide product data on specified products, describing physical and performance characteristics, sizes, patterns, and colors.

D. Submit samples under provisions of Division 01.

E. Submit two samples, 6 inches by 12 inches in size, illustrating color and pattern for each flooring material specified.

F. Submit two heat-welded seam samples for each sheet or material type, 6 inches by 12 inches, with seam running lengthwise in the center.

G. Submit two 4-inch long samples of wall base material of each color specified; include preformed or job-formed corners, as applicable.

H. Submit manufacturer's installation instructions under provisions of Division 01.

1.5 QUALITY ASSURANCE

A. Resilient flooring shall comply with the requirements of CBC Section 804.

B. Concrete slabs to receive resilient flooring shall conform to applicable requirements of ASTM F710.

C. Installer Qualifications: Installer to have at least three years’ experience of installing flooring products in similar facilities.

1.6 SLIP RESISTANCE

A. Resilient flooring shall be stable, firm, and slip resistant per CBC Section 11B-302.1. The static coefficient of friction (COF) shall not be less than 0.5 for level surfaces and 0.8 for ramps, per ASTM D2047.

1.7 SUSTAINABLE DESIGN REQUIREMENTS

A. Resilient flooring shall meet the requirements of the California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Version 1.2, January 2017 (Emission testing method for California Specification 01350).

B. Adhesives shall comply with regulations of South Coast Air Quality Management District Rule 1168 for VOCs.

1.8 JOB AND ENVIRONMENTAL CONDITIONS

A. Store materials for three days prior to installation in area of installation to achieve temperature stability.

B. Maintain ambient temperature required by adhesive manufacturer three days prior to, during and 24 hours after installation of materials.

1.9 OPERATION AND MAINTENANCE DATA

A. Submit cleaning and maintenance data under provisions of Division 01.

B. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, sealing and re-finishing.

1.10 EXTRA MATERIALS

A. Provide 40 square feet of flooring and 20 lineal feet of non-integral wall base of each material and color specified, under provisions of Division 01.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS, LUXURY VINYL TILE FLOORING

A. Acceptable Manufacturers:
   1. J+J Flooring. Product: Alloy #V5008.
   2. Armstrong World Industries, Inc.
   3. Mannington Commercial.
   4. Tarkett, Inc.
   5. Substitutions: Under provisions of Division 01.

B. Luxury Vinyl Tile Materials:
   1. Solid polyvinyl chloride tile, ASTM F1700, Class III printed film vinyl plank, Type B, embossed surface.
   2. Size: 9 inches by 48 inches.
   3. Overall Thickness: 3 mm.
   4. Wear Layer Thickness: 0.020 inch (0.5 mm).
   5. Backing Class: Commercial grade.
   6. Finish: Enhanced UV-cured urethane with ceramic bead.
   7. Pattern Repeat: Random wood pattern.

8. Slip Resistance: ASTM D2047, exceeding 0.5.
9. Static Load Limit: 250 psi.
10. Fire-Test-Response Characteristics:
    a. Smoke Developed: 450 or less, ASTM E662.
    b. Critical Radiant Flux Classification: Class 1, 0.45 watts per square centimeter or greater, ASTM E648.
11. Color and Patterns: As indicated on Drawings.
12. Adhesive: Water-resistant type, as recommended by flooring manufacturer for substrates indicated.
    a. Adhesives shall comply with regulations of South Coast Air Quality Management District Rule 1168 for VOCs.

2.2 MANUFACTURERS AND PRODUCTS, BIOBASED SHEET FLOORING

A. Acceptable Manufacturers:
   1. ShawContract. Product: Innate #4219V.
   2. Armstrong World Industries, Inc.
   3. Azrock.
   4. Substitutions: Under provisions of Division 01.

B. BioBased Sheet Materials:
   1. Construction: Commercial bio-based polyurethane heterogeneous sheet with fiberglass.
   2. Roll Size: 6.59 feet wide by 65.61 feet long.
   3. Thickness: 0.098 inch (2.5 mm).
   4. Finish: ExoGuard+.
   5. Static Load Limit: ASTM F970 (modified), passes at 1500 psi.
   6. Fire-Test-Response Characteristics:
      a. Smoke Developed: 450 or less, ASTM E662.
      b. Critical Radiant Flux Classification: Class 1, 0.45 watts per square centimeter or greater, ASTM E648.
   7. Color and Patterns: As indicated on Drawings.
   8. Heat-Welding Bead: Solid-strand product as standard with flooring manufacturer. Color of heat-welding beads shall match flooring color.
   9. Adhesive: Water-resistant type, as recommended by flooring manufacturer for substrates indicated.

2.3 MANUFACTURERS AND PRODUCTS, RESILIENT WALL BASE

A. Acceptable Manufacturers:
   1. Mannington Commercial. Product: Burkebase.
   2. Roppe Corporation.
   3. Tarkett.
   4. Substitutions: Under provisions of Division 01.

B. Wall Base Materials:
   1. Wall Base: ASTM F1861, Type TP, (co-extruded thermoplastic rubber).
   2. Style: Cove (base with toe), top set.
   3. Height: 4 inches, unless otherwise indicated.
   4. Thickness: 1/8 inch, minimum.
   5. Finish: Matte.
   6. Lengths: Coils in manufacturer's standard length.
   7. Color: As indicated on Drawings.

C. Wall Base Accessories:
   1. Preformed end stops, and outside corners, of the same material, manufacturer, size, and color as wall base.
   2. Adhesive: Water-based type, as recommended by base manufacturer for substrates indicated.

2.4 MANUFACTURERS AND PRODUCTS, ACCESSORIES

A. Subfloor Filler: Portland cement type at concrete substrate as recommended by flooring material manufacturer.
   1. Acceptable Manufacturer and Products: UZIN products provided by UFLOOR Systems, Inc. or accepted equal.

B. Primers and Adhesives: Water-resistant type, as recommended by flooring and wall base manufacturers. Flooring adhesives shall be compatible for use over the vapor emission control system installed under Section 07 26 50.

C. Resilient Molding Accessories:
   1. Molding Accessories: Rubber, unless otherwise indicated on Drawings. Provide where required or indicated.
      a. Carpet edge or nosing.
      b. Nosing for resilient flooring.
      c. Joiner for tile and carpet.
      d. Transition strips.
      e. Reducer strip for resilient flooring.
   2. Acceptable Manufacturers:
      a. Mannington Commercial.
      b. Roppe Corporation.
      c. Tarkett.
      d. Substitutions: Under provisions of Division 01.
   3. Colors: As selected by Architect.

D. Integral Cove Base Accessories:
   1. Cove Strip (Support Strip): 1-inch radius, as recommended by flooring manufacturer.

2. Cap Strip: Metal, plastic, or rubber cap, as indicated on Drawings.
    a. Shape and Color: Square; color as selected by Architect.

E. Seamless-Installation Accessories:
1. Heat-Welding: Solid-strand product for heat welding seams; color to match floor covering.

F. Cleaners, Sealers and Finishes: All cleaners, sealers, and finishes to be products of one manufacturer. Use products approved by flooring manufacturers in writing.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are smooth and flat with maximum variation of 3/16 inch in 10 feet, and are ready to receive Work.

B. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for concrete relative humidity and alkalinity range, installation tolerances, and other conditions affecting resilient flooring performance. Examine resilient flooring products for type, color, pattern, and potential defects.

C. Contractor shall verify that concrete floors are dry and exhibit negative alkalinity, carbonization or dusting. The concrete relative humidity and alkalinity tests required in Section 07 26 50 shall be performed and documented prior to installation of resilient flooring.

D. Install vapor emission control system per Section 07 26 50.

E. Resilient flooring shall not be installed when the atmospheric relative humidity exceeds sixty percent. Contractor shall provide dehumidifiers as required to maintain sixty percent maximum atmospheric relative humidity for the duration of the resilient flooring installation.

F. Beginning of installation means acceptance of existing substrate and site conditions.

3.2 PREPARATION

A. Prepare substrate in accordance with ASTM F710 and flooring manufacturer’s recommendations.

B. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

C. Apply, trowel, and float filler to leave a smooth, flat, hard surface. Repair all floor irregularities.

D. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

E. Prohibit traffic from area until filler is cured.

F. Broom and vacuum clean substrates to be covered immediately before installing resilient flooring.

G. When required by manufacturer, apply primer to concrete surfaces.

3.3 INSTALLATION

A. General:

1. Install all resilient flooring products and accessories under this Section in accordance with manufacturers' printed instructions.
2. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.
3. Install edge strips at unprotected or exposed edges of flooring including terminations at thresholds and where flooring abuts a dissimilar finished floor material.
4. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

B. Luxury Vinyl Tile Flooring:

1. Straight lay planks starting from center of room.
2. Lay out planks such that:
   a. Width of planks at walls shall not be less than one half of full plank width.
   b. Length of planks shall not be less than nine inches.
3. Do not place cut edges against beveled edges.
4. Mix tile from container to ensure shade variations are consistent. Discard broken, cracked, chipped, or deformed tiles.
5. Adhere planks to substrate using a full spread of adhesive applied to substrate to produce a uniform installation without voids, joint deformation, telegraphing of adhesive spreader marks, and other surface imperfections.

C. Biobased Sheet Flooring:

1. Adhere flooring to substrate using a full spread of adhesive applied to substrate to produce a uniform installation without voids, joint deformation, telegraphing of adhesive spreader marks, and other surface imperfections.
2. Provide heat welded seams as recommended by manufacturer.
   a. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering.
3. Integral Cove Base: Provide where indicated. Cove flooring 6 inches up vertical surfaces, unless otherwise indicated on Drawings, and support at horizontal and vertical junction with cove strip. Butt at top against cap strip.

D. Resilient Wall Base:

1. Install resilient wall base on entire wall perimeter including toe spaces and open ends of cabinets. Set all bases in adhesive as recommended by the manufacturer. All joints in bases, including those at any preformed corners, shall be plumb, flush, tight and inconspicuous. Seat top edge and back of base firmly against the wall.
2. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.
3. Corners and Ends:
   a. At external corners, use preformed units. Install preformed corners before installing straight pieces.
   b. Interior corners shall be mitered and tightly fitted. Use straight pieces of maximum lengths possible.

4. At exposed ends use preformed units.
5. Install base on solid backing. Bond tight to wall and floor surfaces.
6. Scribe and fit to door frames and other interruptions.
7. Do not stretch resilient base during installation.

E. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.4 CLEANING, SEALING, AND POLISHING

A. Remove excess adhesive from floor, base, and wall surfaces without damage. Sweep and vacuum surfaces thoroughly.

B. Clean, seal, and finish floor and wall base surfaces in accordance with manufacturer's written instructions.
1. Wall Base, Rubber: Clean by wiping with soft cloth dampened with warm water.

3.5 PROTECTION

A. Comply with manufacturer’s written instructions for protection of resilient flooring.

B. Protect flooring from damage during construction operations for the remainder construction period. After allowing drying film to disappear, cover flooring until Project Completion.

END OF SECTION

SECTION 09 68 13

TILE CARPETING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Modular carpet tile.

B. Accessories.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 07 26 50 – Vapor Emission Control System.

C. Section 09 29 00 – Gypsum Board: Walls to receive resilient carpet base.

D. Section 09 65 00 – Resilient Flooring: Resilient wall base and transition strips.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. AATCC 134 – Electrostatic Propensity of Carpets.
2. ASTM D1667 – Standard Specification for Flexible Cellular Materials-Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).
3. ASTM E648 – Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
4. ASTM E662 – Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
5. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
6. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
7. CRI 104 – Standard for Installation of Commercial Carpet.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Provide product data on specified products, describing physical and performance characteristics; sizes, patterns, colors available and method of installation.

C. Submit samples for review prior to beginning installation.

D. Submit three full size samples illustrating color and pattern for each carpet material specified. Samples shall be labeled to indicate product name, weight, thickness, weave, and manufacturer's name.

E. Submit manufacturer's installation instructions for review.

F. Submit manufacturer's written Warranty, as described in Article 1.10 of this Section, under provisions of Division 01.

1.5 QUALITY ASSURANCE

A. Concrete slabs to receive tile carpeting shall conform to applicable requirements of ASTM F710.

B. Manufacturer: Company specializing in commercial carpet tile with sufficient documented experience.

C. Installer: Company with sufficient documented experience, approved by manufacturer. All work shall be performed by qualified and experienced mechanics working under the supervision of an experienced supervisor.

D. A certification provided by carpet tile manufacturer shall be furnished to Owner stating that register numbers on carpet tile furnished was manufactured in accordance with these specifications.

1.6 MAINTENANCE DATA

A. Submit three copies of manufacturer's maintenance data for commercial installation to Owner in an 8-1/2 by 11 inch hard cover binder.

B. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, vacuum cleaning, shampooing and recommended type of furniture casters and glides for use with specified carpet tile products.

1.7 REGULATORY REQUIREMENTS

A. Carpet tile work shall conform to applicable requirements of Americans with Disabilities Act (ADA), Article 4.5.

B. Carpet work shall comply with 2022 California Building Code, Chapter 11B, Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing, Section 11B-302 “Floor or Ground Surfaces”, Section 11B-303, “Changes in Level”, and Section 11B-302.2, “Carpet” requirements.

1. Carpet tile edges and trim shall conform to CBC Section 11B-302.2 and Section 11B-303 requirements.
2. Fasten exposed edges to floor surfaces with trim along that edge.
3. Carpet tile shall have a level loop, textured loop, level cut pile, or level cut/uncut pile; height (measured from bottom of tuft) not to exceed 1/2 inch.
4. Carpet tile with a pile height exceeding 1/2 inch above adjoining floor surface, shall have a transition ramp between the surfaces.

C. Carpet shall meet testing requirements of ASTM E648 and ASTM E662.

1. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E648 and ASTM E662 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.8 JOB AND ENVIRONMENTAL CONDITIONS

A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

C. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Maintain minimum 70 degree F ambient temperature at floor level three days prior to, during, and 24 hours after installation of materials.

D. Carpet tiles shall be delivered to job site in original mill wrappings, with each box having register number and tags attached, or register number intact.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Provide full size units equal to five percent of the total area of carpeting, but not less than ten square yards, of each type and color specified. Extra materials shall be packaged, identified, and delivered to Owner under provisions of Division 01.

1.10 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.

2. Failures include, but are not limited to, more than ten percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, and delamination.

3. Warranty Period: Manufacturer’s Lifetime Commercial Limited Warranty.

B. Provide installer’s two year warranty commencing from the date of Project Completion.

C. Submit warranty to Architect, under provisions of Division 01.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Acceptable Manufacturers:
   1. J+J Flooring Group, Dalton, GA; 800-241-4586, www.jjflooringgroup.com. Products:
      a. C1: Fractured Plaid #7587.
      b. C2 and C3: Network #1842.
   2. Tandus Centiva, Dalton, GA; 800-248-2878, www.tandus.com.
   3. Shaw Contract Group, Calhoun, GA; 800-257-7429, www.shawcontractgroup.com.
   4. Mohawk Group, Calhoun, GA; 800-554-6637, www.mohawkgroup.com.
   5. Interface, LaGrange, GA; 800-634-6032, www.interface.com.

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Carpet Tile (C1): Conforming to the following criteria:

1.	Size:	24 inches by 24 inches.
2.	Construction:	Tip sheared patterned loop.
3.	Gauge:	1/12 inch.
4.	Stitches per Inch:	11.
5.	Face Weight:	23 ounces per square yard.
6.	Pile Density:	9258 ounces per cubic yard.
7.	Fiber Type:	Encore BCF with recycled content.
8.	Dye Method:	Solution/Yarn dyed.
9.	Soil Release:	ProTex.
10.	Total Recycled Content:	45.66 percent.
11.	Backing:	Nexus Modular.
12.	Flammability:	Class 1 (CRF: 0.45 watts per square centimeter or higher), per ASTM E648.
13.	Smoke Density:	NBS Smoke Density, less than 450 per ASTM E662.
14.	Static Propensity:	AATCC-134, 3.0 KV or lower; permanent conductive fiber.
15.	Color:	As indicated on Drawings.

B. Carpet Tile (C2 and C3): Conforming to the following criteria:

1.	Size:	12 inches by 48 inches.
2.	Construction:	Textile composite.
3.	Wear Layer:	Polyester - applied pattern.
4.	Total Weight:	4.5 ounces per square foot to 5.2 ounces per square foot ounces per square yard.
5.	Total Thickness:	0.205 inch.

6.	Dye Method:	Solution dyed.
7.	Soil Release:	Kinetex ProTex.
8.	Total Recycled Content:	45 percent.
9.	Backing:	Polyester felt cushion.
10.	Flammability:	Class 1 (CRF: 0.45 watts per square centimeter or higher), per ASTM E648.
11.	Smoke Density:	NBS Smoke Density, less than 450 per ASTM E662.
12.	Static Propensity:	AATCC-134, 3.0 KV or lower; permanent conductive fiber.
13.	Color:	As indicated on Drawings.

2.3 ACCESSORIES

A. Subfloor Filler: Portland cement type as recommended by flooring material manufacturer.

1. Acceptable Manufacturer and Products: UZIN products provided by UFLOOR Systems, Inc. or accepted equal.

B. Primers and Adhesives:

1. VOCs: Primers and adhesives shall comply with regulations of South Coast Air Quality Management District Rule 1168 for VOCs.
2. Primers: As recommended by carpet tile and adhesive manufacturer.
3. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
    a. Adhesives shall be compatible for use over the vapor emission control system installed under Section 07 26 50.

C. Resilient Wall Base and Transition Strips: Refer to Section 09 65 00 for resilient wall base and transition strips.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are smooth and flat with maximum variation of 3/16 inch in 10 feet and are ready to receive work.

B. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for concrete relative humidity and alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

C. Contractor shall verify that concrete floors are dry and exhibit negative alkalinity, carbonization or dusting. The concrete relative humidity and alkalinity tests required in Section 07 26 50 shall be performed and documented prior to installation of carpet.

D. Install vapor emission control system per Section 07 26 50.

E. Carpet tile shall not be installed when the atmospheric relative humidity exceeds sixty percent. Contractor shall provide dehumidifiers as required to maintain sixty percent maximum relative humidity for the duration of the carpet tile installation.

F. Beginning of installation means acceptance of existing substrate and site conditions.

3.2 PREPARATION

A. General: Comply with ASTM F710, CRI 104, and with carpet manufacturer's written installation instructions for preparing substrates.

B. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.

C. Apply, trowel and float filler to leave smooth, flat, hard surface. Repair all floor irregularities.

D. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

E. Prohibit traffic until filler is cured.

F. Broom and vacuum clean substrates to be covered immediately before installing carpet.

G. When required by manufacturer, apply primer to concrete surfaces.

H. Allow carpet to acclimate at installation location for at least 72 hours prior to beginning installation.

3.3 INSTALLATION

A. Comply with CRI 104 and with carpet tile manufacturer's written installation instructions.

B. Installation Pattern: Install modular tile using the following techniques:

1. C1: Monolithic.
2. C2 and C3: Custom pattern as indicated on Drawings.

C. Installation Method: As recommended in writing by carpet tile manufacturer.

D. Maintain dye lot integrity. Do not mix dye lots in the same area.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.

H. Install pattern parallel to walls and borders, unless otherwise indicated on Drawings.

I. Install edge strips at unprotected or exposed edges of carpet tile including terminations at thresholds and where carpet tile abuts a dissimilar finished floor material. Carpet tile edges and trim shall comply with CBC Section 11B-302.2 and Section 11B-303 requirements.

3.4 CLEANING

A. Remove excess adhesive from floor, base and wall surfaces without damage. Remove and dispose of all scraps, cartons and rubbish upon completion of the work. Remove all loose yarn with sharp scissors.

B. Clean carpet tiles of all spots with proper spot remover and vacuum clean carpet tile surfaces.

3.5 PROTECTION

A. Prohibit traffic from carpet tile areas for 24 hours after installation. Installer shall take necessary steps to protect carpet tile work and the work of other trades during carpet tile installation, and shall be responsible for restoration of work or property damaged by carpet tile installer.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protection of Indoor Installations".

C. Protect carpet tile from damage during construction operations for the remainder construction period. Cover carpet tile until Project Completion.

END OF SECTION

SECTION 09 77 10

SANITARY WALL AND CEILING FINISHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fiberglass Reinforced Plastic Panels.

B. Accessories.

1.2 RELATED SECTIONS

A. Section 07 92 00 – Joint Sealants.

B. Section 09 29 00 – Gypsum Board.

C. Section 09 91 00 – Painting.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM D256 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
2. ASTM D570 – Standard Test Method for Water Absorption of Plastics.
3. ASTM D638 – Standard Test Method for Tensile Properties of Plastics.
4. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
5. ASTM D2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
6. ASTM D5319 – Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
7. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Indicate on shop drawings, detail dimensions and trim and panel attachment details.

C. Provide product data on panels, trim and adhesive.

D. Submit samples under provisions of Division 01.

E. Submit two samples, 6 inches x 6 inches in size, illustrating panel material, color, and finish.

F. Submit two samples, 6 inches long in size, illustrating trim material, color and finish.

G. Submit manufacturer's installation instructions under provisions of Division 01.

1.5 WARRANTY

A. Furnish one-year warranty against defects in material and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Marlite. Product: Standard FRP.

B. Panolam Industries International, Inc., Shelton, CT, 888-375-9255, www.panolam.com. Product: Classic Collection.

C. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Fiberglass Reinforced Plastic Panels (FRP): Smooth surface, color as indicated on Drawings, four feet x eight feet x 0.090 inch. Class A Fire Rated; Flame Spread less than 25; Smoke Developed less than 450 per ASTM E84.

B. Accessories and Adhesives: Manufacturer's standard adhesive and aluminum joinery trim system that conceals each vertical joint and exposed edges. Trim color as selected by Architect.

PART 3 EXECUTION

3.1 PREPARATION

A. All surfaces to receive FRP shall be properly prepared in strict accordance with manufacturer's specifications and as specified herein. Fill all pinholes, cracks and other surface imperfections with spackle and scrape off surface splatters and imperfections to leave substrate surfaces smooth and free of damage. Gypsum board surfaces scheduled to receive adhesive-applied panels shall be prime coat painted under provisions of Section 09 91 00 prior to installation of panels.

B. All other trade work that penetrates substrate shall be completed before beginning FRP application.

3.2 APPLICATION

A. Install FRP panels according to manufacturer's instructions. No horizontal seams will be permitted.

B. FRP shall be installed with adhesive supplied by or recommended by the FRP manufacturer.

C. Install trim in longest practicable lengths. “Piecing” of trim will not be allowed.

D. Remove excessive adhesive from surfaces immediately.

E. Ensure positive contact of FRP to adhesive material with all wall surfaces. Remove or replace damaged or improperly applied FRP.

3.3 CLEAN-UP

A. Upon completion of the work of this Section, remove all surplus material, and debris from the premises.

END OF SECTION

SECTION 09 77 26

RESINOUS WALL AND FLOOR SURFACING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Furnish necessary material, labor, and equipment required to prepare designated areas to install a resinous surfacing system.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 04 22 00 – Concrete Unit Masonry.

C. Section 07 26 50 – Vapor Emission Control System.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ACI 302 – Guide to Concrete Floor and Slab Construction.
2. ASTM D638 – Standard Test Method for Tensile Properties of Plastics.
3. ASTM D2047 – Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
4. ASTM D2240 – Standard Test Method for Rubber Property - Durometer Hardness.
5. ASTM D4060 – Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
6. ASTM D7234 – Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
7. ASTM F1679 – Standard Test Method for Using a Variable Incidence Tribometer (VIT).
8. MIL 810G – Environmental Engineering Considerations and Laboratory Tests.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Submit typical shop drawings showing details, thickness of materials, and typical installation requirements and details.

C. Submit three – 6 inch x 6 inch cured system samples for verification purposes and finish color and texture acceptance.

D. Submit two copies of the manufacturer’s maintenance instructions.

1.5 QUALITY ASSURANCE

A. Manufacturer's and Contractor's Qualifications. Manufacturer and installer of resinous surfacing system shall be one and the same. Installation must be performed by the manufacturer with their own skilled technicians having not less than three completed projects of the same type system as specified in this Section.

B. Mock-up:

1. Provide an in-place 6 foot by 6 foot flooring mock-up in location directed by Architect using accepted product sample, installation method, and finish. Mockup shall verify selections made under sample submittals, demonstrate aesthetic effects, set quality standards for materials and execution, and set quality standards for installation.
2. Do not proceed with remainder of product installation until mock-up has been accepted by Architect.
3. Accepted mock-up may be incorporated into final construction.
4. Accepted mock-up shall establish the standard by which the remainder of the work will be judged.

1.6 WARRANTY

A. The manufacturer/contractor shall furnish a standard guarantee of the resinous surfacing system for a period of one year after installation. The labor and material guarantee shall include loss of bond and wear-through to the concrete substrate from normal use.

B. Not included in the warranty are damage due to structural design deficiencies including, but not limited to, slab cracking from lateral, vertical or rotational movement, and gouging or other damage due to forklifts, other equipment, delamination caused by vapor transmission, Acts of God, or other elements beyond the scope of protection of this system nor causes not related to the system materials.

C. In case of a warranty claim, the Owner will notify the manufacturer/contractor in writing within 30 days of the first appearance of problems covered under this warranty. The Owner shall provide free and unencumbered access to the area during normal working hours for warranty rework. Property protection is the Owner's responsibility. Remedy is limited to direct repair of the resinous surfacing system.

PART 2 PRODUCTS

2.1 MATERIALS

A. Acceptable Manufacturers:

1. Basis-of-Design: Gold Medal Construction Corporation, Lehigh Acres, FL; (239) 303-7380, www.thedecofloor.com. Systems:
   a. EP1: DecoFloor Flake System.
   b. EP2: DFL 950 Seamless Shower System.
2. Sika Corporation, Lyndhurst, NJ; 800-933-7452, www.sikafloorusa.com.
3. General Polymers – a Division of The Sherwin-Williams Company, Cincinnati, OH; 800-543-7694, www.generalpolymers.com.
4. Dex-O-Tex – a Division of Crossfield Products Corp., Rancho Dominguez, CA; 310-886-9100, www.dexotex.com.

5. BASF Performance Flooring, Shakopee, MN; 510-417-0049, www.BASFBuildingSystems.com.

B. Substitutions: Under provisions of Division 01.

2.2 SYSTEM OVERVIEW

A. Type EP1 resinous surfacing system shall consist of DecoFloor 100 percent Solids Primer, DecoFloor 100 percent Solids Urethane Color Base Coat, Decorative Color Vinyl Chip Aggregate, and DecoFloor Aliphatic Urethane Clear Gloss Sealer. Overall thickness: 1/16 inch to 1/8 inch. Color as indicated on Drawings.

1. Aggregate (EP1): Decorative Color Vinyl Chip Aggregate.

B. Type EP2 resinous surfacing system shall consist of DecoFloor Moisture Mitigation Primer, DecoFloor 100 percent Solids Urethane Color Base Coat, and DecoFloor Urethane Clear Gloss Sealer. Overall minimum thickness: 1/16 inch. Color as indicated on Drawings.

2.3 PROPERTIES

A. Typical Physical Properties of resinous surfacing system:

1. Hardness (ASTM D2240): 70 Shore D
2. Tensile Strength (ASTM D638): 2,500 psi
3. Elongation (ASTM D638): 65 percent
4. Bond Strength (ASTM D7234): > 400 psi (100 percent concrete failure)
5. Abrasion (ASTM D4060): 69 mg loss
6. Coefficient of Friction (ASTM F-1679) (Dry): 0.77
7. Coefficient of Friction (ASTM F-1679) (Wet): 0.66
8. Coefficient of Friction (ASTM D2047): 0.60
9. Abrasion Resistance (ASTM D-4060, CS17): <0.20 mg
10. MIL 810G: Environmental Engineering: 0,0,0,0,0 Considerations (Fungus Resistance)

PART 3 EXECUTION

3.1 EXAMINATION

A. Visit the jobsite prior to the installation of the resinous surfacing system to evaluate substrate condition, including substrate relative humidity and pH values, quantity and severity of cracking, and the extent of repairs needed. Substrate imperfections shall be repaired only after mechanical preparation of the substrate. Surface preparation reveals most imperfections requiring repair.

B. Contractor shall verify that concrete floors are dry and exhibit negative alkalinity, carbonization or dusting. The concrete relative humidity and alkalinity tests required in Section 07 26 50 shall be performed and documented prior to installation of resilient flooring.

C. Install vapor emission control system per Section 07 26 50.

D. Exercise care during surface preparation and system installation to protect surrounding substrates and surfaces not scheduled to receive system, as well as in-place equipment. Prepare the substrate to remove laitance and open the surface. This shall be achieved by light brush grit blasting or by acid etching. Surface profile achieved shall be similar to medium grit sandpaper and free from bond-inhibiting contaminants.

E. Sub floor tolerances are specified in Section 03 30 00 in accordance with ACI 302. Each drain in the installation area must be working and raised or lowered to the actual finished elevation of the resinous surfacing system.

F. System must be protected until it is inspected and turned over to the Owner. The minimum slab temperature must be conditioned to 60 degrees F before commencing installation, during installation, and for at least 72 hours after installation is complete. The substrate temperature must be at least 5 degrees F above the dew point during installation.

G. Maintain lighting at a minimum uniform level of 50 or more foot candles in areas where the resinous surfacing system is being installed. The permanent lighting shall be in place and working during the installation.

H. Leaks from pipes and other sources must be corrected prior to the installation of the resinous surfacing system.

3.2 SURFACE PREPARATION

A. Preparation of concrete substrate as recommended by resinous surfacing system manufacturer.

B. Where resinous surfacing system is applied to concrete unit masonry walls, joints shall be struck flush.

3.3 INSTALLATION

A. Apply each component of the resinous surfacing system in compliance with manufacturer's written installation instructions and strictly adhere to mixing and installation methods, recoat windows, cure times, and environmental restrictions. The resinous surfacing system shall be installed directly over non-moving control joints and cracks which have been treated with DecoFloor Fill, and the resinous surfacing system will terminate at the edge of isolation and expansion joints as designated by the Architect. Integral cove base shall be installed where specified in the Drawings.

B. Cracks and Control Joints: After preparation, evaluation of quantity and severity of cracks in concrete will determine the needed repairs. Cracks and control joints shall be treated in accordance with resinous surfacing system manufacturer’s recommendations.

C. Isolation/Expansion and Other Joints Subject to Movement: All expansion joints must be honored through the flooring system.

D. System Primer:

1. EP1 – DecoFloor 100 percent Solids Primer.
2. EP2 – DecoFloor Moisture Mitigation Primer.

E. Base Coat: DecoFloor 100 percent Solids Polyurethane Color Base Coat.

F. Chip Broadcast: DecoFloor Decorative Vinyl Chip Aggregate.

G. Seal Coat:

1. EP1 – DecoFloor Aliphatic (UV Stable) Polyurethane Sealer..
2. EP2 – DecoFloor Urethane Clear Gloss Sealer.

3.4 CURING, CLEANING AND PROTECTION

A. Cure the resinous surfacing system materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of the installation and prior to completion of the curing process.

B. Protect the resinous surfacing system from damage and wear during other phases of the construction operation, using temporary coverings as recommended by the manufacturer. Remove temporary covering just prior to final inspection.

C. Clean the resinous surfacing system just prior to final inspection, using materials and procedures suitable to the system manufacturer.

1. Some cleaners will affect the color, gloss, or texture of polymer floor surfaces. For recommendations regarding types of cleaners, contact the resinous surfacing system manufacturer.

END OF SECTION

SECTION 09 81 00

ACOUSTIC INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Acoustic insulation in interior wall construction.

1.2 RELATED SECTIONS

A. Section 07 21 00 – Thermal Insulation.

B. Section 09 22 16 – Non-Structural Metal Framing.

C. Section 09 29 00 – Gypsum Board.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM C665 – Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
2. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
3. UL 723 – Test for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Provide data on product characteristics, performance criteria and limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed California Quality Standards.

1.5 SYSTEM DESCRIPTION

A. Materials of this Section: Provide continuity of acoustic barriers and separations at building interior elements.

1.6 SUSTAINABLE DESIGN REQUIREMENTS

A. Products of this Section shall meet the requirements of the California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Version 1.2, January 2017 (Emission testing method for California Specification 01350).

B. Insulation products shall be formaldehyde-free.

C. Recycled Content: Minimum twenty percent post-consumer.

1.7 COORDINATION

A. Coordinate work with other trades under provisions of Division 01.

PART 2 PRODUCTS

2.1 GLASS FIBER BATT INSULATION

A. Acceptable Manufacturers:
1. Knauf Insulation, Shelbyville, IN; 317-398-4434, www.knaufusa.com. Product: EcoBatt.
2. Owens-Corning, Toledo, OH; 800-438-7465, www.owenscorning.com.
3. Certainteed Corp., Insulation Group, Valley Forge, PA; 800-233-8990, www.certainteed.com.
4. Johns Manville, Denver, CO; 800-654-3103, www.specJM.com.
5. Thermafiber, Inc., Wabash, IN; 888-834-2371, www.thermafiber.com.
6. Substitutions: Under provisions of Division 01.

B. Batt Insulation: ASTM C665 Type I; preformed glass fiber batt; conforming to the following:
1. Facing: Acoustic insulation shall be unfaced.
2. Flame Spread and Smoke Density Properties: 25/450 maximum in accordance with 2022 CBC Section 720, ASTM E84, and UL 723.
3. Provide formaldehyde-free thermal insulation products.
4. Recycled Content: Minimum twenty percent post-consumer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing site conditions.

B. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

3.2 INSTALLATION – BATT INSULATION

A. Install insulation in accordance with insulation manufacturer's instructions and with the flame spread rating and smoke density requirements of CBC Section 720, ASTM E84, and UL 723.

B. Install in interior walls, full width, depth, and height of cavity, without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.

E. Securely fasten and anchor insulation in place to prevent displacement or sagging of material in all areas.

1. At metal stud walls, the insulation shall be wired in place with two #14 spring steel wires, one within 12 inches of the top and one at the mid-point of each stud bay.

END OF SECTION

SECTION 09 84 13

FIXED SOUND - ABSORPTIVE PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fabric faced acoustical wall panels.

B. Installation accessories.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 09 22 16 – Non-Structural Metal Framing.

C. Section 09 29 00 – Gypsum Board.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM C423 – Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
2. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit shop drawings, product data, samples, and installation instructions under provisions of Division 01.

B. Shop Drawings: Indicate wall elevations, dimensions, joint locations, penetrations, and anchorage details.

C. Product Data: Indicate specific products and related accessories to be provided for this Project.

D. Submit test data to show compliance with requirements for acoustical and flammability ratings.

E. Submit two samples, 12 inches x 12 inches in size, illustrating materials and finish, color, and texture of surface, core material, edge, corner details, and wall mounting hardware.

F. Submit manufacturer's installation instructions specific to mounting conditions on this project.

G. Maintenance Data: Provide recommended procedures for cleaning and removal of stains. Include precautions in use of cleaning materials that may be detrimental to surfaces.

1.5 REGULATORY REQUIREMENTS

A. Conform to California Building Code for Class “A” rating for fabric covered acoustic panels in accordance with ASTM E84.

B. Core material shall meet the requirements of the California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Version 1.2, January 2017 (Emission testing method for California Specification 01350).

1.6 QUALITY ASSURANCE

A. Single Source Responsibility:

1. Obtain acoustical panel materials from a single manufacturer. Provide acoustical panels and fabrics of each type required from one manufacturer, of uniform texture and color.

B. Experience:

1. Provide products for this Section that are designed and furnished by one manufacturer, factory-assembled and shipped as a unit. Manufacturer shall have been engaged in the manufactures of sound absorbing panels for at least five years immediately prior to the start of this work.

2. Contractor shall have sufficient documented experience in the purchase and installation of acoustical wall panels and baffles. Contractor shall submit proof of previous experience and list a minimum three previous jobs of similar or larger size.

C. Materials:

1. The fabric used for the fabric faced acoustical wall panels shall all be from the same batch of material with sufficient extra material available for patching. Submit manufacturer’s certificate of compliance.

2. Comply with referenced American Society for Testing and Materials (ASTM).

3. Comply with Underwriter’s Laboratories, Inc. (UL) requirements for fire rated systems. Furnish listed and labeled products.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and protect products under provisions of Division 01.

B. Deliver materials to the job site in manufacturer’s original, unopened containers and packaging, with labels clearly indicating manufacturer and material.

1. Do not deliver materials to the building until the completion of wet work, such as concrete, plastering, and painting has been completed and the building is completely enclosed.

C. Protect products against damage during delivery and handling.

D. Store all items in a clean, dry indoor storage area, protected from damage, and in accordance with manufacturer’s instructions.

E. Maintain temperature in storage area above 40 degrees F, without excessive humidity.

F. Do not install damaged material.

1.8 ENVIRONMENTAL CONDITIONS

A. Do not install acoustical panels until the building space is enclosed and weather-tight, work above ceilings completed, and until ambient conditions of temperature and humidity will be continuously maintained at values near final occupancy.

B. Remove material from packaging and allow to acclimatize in area of installation 24 hours before application.

C. Install under same temperature, humidity conditions that will normally exist when building is occupied.

D. Maintain temperature of all areas to receive acoustical wall panels at 60 degrees F to 85 degrees F and relative humidity not greater than seventy percent for 72 hours before, during, and 48 hours minimum after application.

1.9 EXTRA MATERIALS

A. Deliver extra materials equal to five percent of each type of acoustical panel provided under provisions of Division 01.

B. All cartons shall be new, unopened, packaged with protective covering for storage, and identified with appropriate labels.

1.10 WARRANTY

A. Submit under provisions of Division 01.

B. Materials shall be warranted against defects and workmanship for a period of five years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND PRODUCTS

A. Lamvin Inc., Oceanside, CA; 800-446-6329, www.lamvin.com. Product: Sonic Series, Ultra High-Impact Acoustical Panels.

B. Tectum, Inc., Newark, OH; 888-977-9691, www.tectum.com. Product: Fabri-Tough.

C. Conwed Designscape / Wall Technology, Ladysmith, WI; 800-932-2383, www.conweddesignscape.com. Product: IR 108.

D. Kinetics Noise Control, Inc., Dublin, OH; 877-457-2695, www.kineticsnoise.com. Product: High Impact Hardside.

E. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Fabricate panels to sizes and configurations indicated on Drawings; attach facing materials to cores to produce installed panels with visible surfaces fully covered and free of wrinkles, sags, blisters, seams, adhesive or other foreign matter and wrapped 2 inches to the back.

1. Fabricate panels in factory to exact sizes required to fit wall surfaces based on field measurements of completed substrates indicated to receive wall panels.

2. Where square corners are indicated, tailor corners.
3. Dimensional tolerances of finished units: ±1/16 inch.

B. Acoustical wall panels: Facing material laminated to front face, edges and back border of dimensionally stable, rigid glass fiber board core; with edges chemically hardened to reinforce panel perimeter against warpage and damage.

C. Panel Characteristics:
1. Thicknesses: 2-1/16 inches.
2. Acoustical Core: 6 pound to 7 pound density, rigid fiberglass.
3. Core Facing: Perforated co-polymer plastic, 1/16-inch thick, 3/32-inch diameter holes on 5/32 inch staggered centers with 33 percent open area.
4. Edge Detail: Square; chemically hardened edges to reinforce panel perimeter against warping and damage.
5. Panel Width and Height: Refer to Drawings.
6. Finish: Fabric shall be bonded directly to panel face with all edges wrapped a minimum of 2 inches to the back of the panel to ensure a flat, wrinkle-free surface with tailored corners.
   a. Manufacturer and Product: Carnegie Fabrics. Product:
      1) Xorel Switch 6237, or accepted equal.
   b. Content: 100 percent IFR Xorel.
   c. Backing: Unbacked.
   d. Width: 56 inches.
   e. Repeat: 13.5 inches.
   f. Weight: 10.24 ounces per linear yard.
   g. Flammability: Class A per ASTM E84:
      1) Flame Spread: Less than 25.
      2) Smoke Developed: Less than 450.
   h. Colors: As indicated on Drawings.
7. Class A flame spread rating (ASTM E84 Tunnel Test).
8. Mounting: Concealed spline and adhesive.
9. NRC: 1.05 for 2 inch acoustical thickness per ASTM C423.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify that surfaces and internal wall blocking are ready to receive work, and dimensions are as indicated on shop drawings.

B. Examine surfaces scheduled to receive acoustical units for unevenness, irregularities, and dampness that would affect quality and execution of work. Do not proceed with work until unsatisfactory conditions have been corrected.

C. Beginning of installation means acceptance of substrate construction.

3.2 INSTALLATION

A. Install acoustical wall panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, and scribed to fit adjoining work accurately at borders and penetrations.

B. Comply with panel manufacturer's written instructions for installation of panels using type of mounting accessories indicated or, if not indicated, as recommended by manufacturer.

C. All fastening devices shall be concealed in completed installation.

D. Wall panels shall be securely affixed by concealed spline and adhesive method of attachment.

E. Clips shall engage vertical kerfs on the edges of the wall panels. Apply adhesive where necessary.

F. Field cut edges shall be covered by means of on-site fabric wrapping.

G. Cut and fit around equipment on walls such as electrical switches, receptacles, fire alarm components, grilles, etc. Where field cutting occurs, make cuts true and plumb and wrap cut edges to match factory wrapped edges.

H. Prior to final inspection and/or occupancy of the building by the Owner, review installation and replace all damaged panels, leaving installation complete and ready for occupancy by the Owner without further work.

3.3 CLEANING

A. Clip any loose threads; remove pulls and extraneous materials.

B. Clean exposed surfaces of acoustical wall panels to remove dust and any other foreign materials and trim edge moldings to comply with manufacturer's instruction for cleaning and touch-up of minor finish damage.

C. Remove surplus materials, rubbish and debris resulting from installation on completion of work, and leave the area of installation in a neat clean condition.

D. Replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, as directed by Architect.

3.4 PROTECTION

A. Provide required protection for the acoustical wall panels, including temperature, humidity limitations and dust control so that the work will be without damage and deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 09 91 00

PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Painting schedules, including painting of exposed surfaces, interior and exterior, except as otherwise specified or indicated.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 05 12 00 – Structural Steel Framing.

C. Section 05 31 00 – Steel Decking.

D. Section 05 50 00 – Metal Fabrications.

E. Section 07 62 00 – Sheet Metal Flashing and Trim.

F. Section 08 11 13 – Hollow Metal Doors and Frames.

G. Section 08 31 00 – Access Doors and Panels.

H. Section 08 91 19 – Fixed Louvers.

I. Section 09 29 00 – Gypsum Board.

J. Divisions 21 – 23 – Mechanical.

K. Divisions 26 – 28 – Electrical.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards, Manuals and Codes:

1. ASTM D523 – Standard Test Method for Specular Gloss.
2. The Master Painters Institute, MPI Gloss and Sheen Levels.

1.4 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Provide product data on all painting products and accessories.

C. Submit four brush-out samples 8 inches by 10 inches in size illustrating color selected for each surface finishing product scheduled.

D. During the Contract Closeout period, provide two copies of coating maintenance manual including, but not limited to, location of manufacturer's paint store closest to the project site, area summary with finish schedule, area detail designating where each product, color, and finish was used, product data sheets and material safety data sheets for each product used, color formulations for each color used, cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 QUALITY ASSURANCE

A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with sufficient documented experience.

B. Applicator: Company specializing in commercial painting and finishing with sufficient documented experience.

C. Gloss Levels: Per Master Painters Institute (MPI) gloss standards "MPI Gloss and Sheen Levels," measured in accordance with ASTM D523.

GLOSS LEVEL	DESCRIPTION	GLOSS AT 60 DEGREES ASTM D523	SHEEN AT 85 DEGREES ASTM D523
G1	A traditional matte finish – flat.	5 units, maximum	and 10 units, maximum
G2	A high side sheen flat - "a velvet-like" finish.	10 units, maximum	and 10 - 35 units
G3	A traditional "eggshell-like" finish.	10 - 25 units	and 10 - 35 units
G4	A "satin-like" finish.	20 - 35 units	and 35 units, minimum
G5	A traditional semi-gloss.	35 - 70 units	-
G6	A traditional gloss.	70 - 85 units	-
G7	A high gloss.	More than 85 units	-

1.6 REGULATORY REQUIREMENTS

A. Conform to California Building Code for flame spread and smoke density requirements for finishes.

B. Furnish certification that all paint coatings furnished for the location of the project comply with the EPA clean air act for permissible levels of volatile organic content for architectural coatings applied in California as designated by California Air Resources Board (CARB).

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site in manufacturer's original unopened, labeled containers; inspect to verify acceptance.

B. Store and protect products from abuse and contamination.

C. Container labeling is to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation and instructions for mixing and reducing.

D. Store paint materials at minimum ambient temperature of 50 degrees F and a maximum of 90 degrees F, in well-ventilated area, unless required otherwise by manufacturer's instructions.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 50 degrees F for 24 hours before, during and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is above fifty percent, unless required otherwise by manufacturer's instructions.

C. Minimum Application Temperatures for Paints: 50 degrees F for interior work and exterior work, unless required otherwise by manufacturer's instructions.

D. Provide lighting level of 80 foot candles measured mid-height at substrate surface.

1.9 EXTRA STOCK

A. Provide a new and unopened one-gallon container of each type, color, and sheen to Owner.

B. Label each container with color, in addition to the manufacturer's label.

PART 2 PRODUCTS

2.1 PAINT SYSTEMS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

2.2 SUSTAINABLE DESIGN REQUIREMENTS

A. VOC Content of Field-Applied Paints and Coatings: Provide products that comply with the SCAQMD rule 1113 limits for VOC content.

2.3 ACCEPTABLE MANUFACTURERS – PAINT

A. Refer to Table at the end of this Section.

B. Substitutions: Under provisions of Division 01.

2.4 ACCEPTABLE MANUFACTURERS – PRIMER SEALERS

A. Refer to Table at the end of this Section.

B. Substitutions: Under provisions of Division 01.

2.5 MATERIALS

A. All paint materials shall be provided from a single manufacturer unless noted otherwise in this Section.

B. Coatings:

1. Ready mixed. Process pigments to a soft paste consistency capable of being readily and uniformly dispersed to a homogeneous coating.

2. Good flow and brushing properties; capable of drying or curing free of streaks or sags.

C. All field-applied interior paints shall use zero VOC colorants.

D. Accessory Materials: All other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

2.6 FINISHES

A. Refer to schedule at end of Section for surface finish schedule. Refer to Drawings for color schedule.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Gypsum Wallboard: 18 percent.

2. Concrete Masonry Units: 10 percent.

D. Beginning of application constitutes acceptance of existing surfaces.

3.2 PREPARATION

A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces for painting.

B. Correct minor defects and clean surfaces that affect work of this Section.

C. Seal marks that may bleed through surface finishes.

D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

E. Gypsum Board Surfaces: Latex fill minor defects. Spot-prime defects after repair.

F. Galvanized Surfaces: Remove passivators, oil, grease, acid residue, and surface contamination; wash with solvent. Apply coat of etching primer, unless otherwise recommended by finish coating system manufacturer.

G. Shop-Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces as recommended by primer manufacturer. Prime shop-primed steel items with steel primers specified in this Section.

3.3 PROTECTION

A. Protect elements surrounding the work of this Section from damage or disfiguration.

B. Repair damage to other surfaces caused by work of this Section.

C. Furnish drop cloths, shields and protective methods to prevent spray or droppings from disfiguring other surfaces.

D. Remove empty paint containers from site.

3.4 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

1. Paint mil thicknesses shall not be less than the minimums recommended by the paint manufacturers.

B. Do not apply finishes to surfaces that are not dry.

C. Apply each coat to uniform finish.

D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

E. Sand lightly between coats to achieve required finish.

F. Allow applied coat to dry before next coat is applied.

G. All shop-primed items shall be fully re-primed in the field.

H. Concrete Block Filler: Apply to a Level 3 Premium Fill per Painting and Decorating Contractors of America (PDCA) Standard P12.

3.5 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. See Divisions 21 – 23 and 26 – 28 for other items requiring painting.

B. Paint interior surfaces of air ducts and convector heating cabinets that are visible through grilles and louvers with one) coat of flat black paint, to limit of sight line. Paint dampers exposed behind grilles to match face panels. Paint all new interior and exterior exposed ductwork and ductwork supports. Paint all new conduit, pipes, and conduit/pipe supports in exposed interior and exterior locations.

C. Reinstall electrical plates, hardware, light fixture trim, and fittings removed for surface preparation or painting.

D. Do not paint factory-finished mechanical and electrical equipment.

3.6 CLEANING

A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.

B. During progress of Work, maintain premises free of unnecessary accumulation of tools, equipment, surplus materials and debris.

C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove from site daily.

3.7 PAINTING SCHEDULE – EXTERIOR SURFACES

A. Galvanized Metal (Industrial) – For use at exterior metal architectural features/exposed structure:
   1. 1st coat – Epoxy Flat Primer
   2. 2nd and 3rd coats – Aliphatic Urethane Gloss Enamel

B. Galvanized Metal and Aluminum:
   1. 1st coat – Etch Prep
   2. 2nd coat – Acrylic Flat Primer
   3. 3rd and 4th coats – 100 percent Acrylic Low Sheen

C. Galvanized Metal and Aluminum:
   1. 1st coat – Etch Prep
   2. 2nd coat – Acrylic Flat Primer
   3. 3rd and 4th coats – 100 percent Acrylic Semi-Gloss

3.8 PAINTING SCHEDULE – INTERIOR SURFACES

A. Gypsum Board:
   1. 1st coat – PVA Flat Primer Sealer
   2. 2nd and 3rd coats – Acrylic Semi-Gloss Enamel

B. Gypsum Board:
   1. 1st coat – PVA Flat Primer Sealer
   2. 2nd and 3rd coats – Acrylic Eggshell Enamel

C. Gypsum Board:
   1. 1st coat – Acrylic Flat Primer
   2. 2nd and 3rd coats – Waterborne Semi-Gloss Epoxy

D. Ferrous Metal:
   1. 1st coat – Acrylic Flat Primer
   2. 2nd and 3rd coats – Acrylic Eggshell Enamel

E. Ferrous Metal:
   1. 1st coat – Acrylic Flat Primer
   2. 2nd and 3rd coats – Acrylic Semi-Gloss Enamel

F. Galvanized Metal, Zinc Alloy Metal, and Aluminum:
   1. 1st coat – Etch Prep
   2. 2nd coat – Acrylic Flat Primer
   3. 3rd and 4th coats – Acrylic Eggshell Enamel

G. Galvanized Metal, Zinc Alloy Metal, and Aluminum:
   1. 1st coat – Etch Prep
   2. 2nd coat – Acrylic Flat Primer
   3. 3rd and 4th coats – Acrylic Semi-Gloss Enamel

H. Masonry (CMU):
   1. 1st coat – Acrylic Flat Block Filler Primer
   2. 2nd and 3rd coats – Acrylic Semi-Gloss Enamel

I. Masonry (CMU):
   1. 1st coat – Acrylic Flat Block Filler Primer
   2. 2nd and 3rd coats – Waterborne Semi-Gloss Epoxy

REFER TO PAINT TABLE ON NEXT PAGE

APPLICATION	TYPE	MPI Gloss Level	MANUFACTURERS				
			Dunn Edwards/US Coatings	PPG Paints	Sherwin Williams	Kelly Moore/Devoe	Benjamin Moore
PRIMERS							
Exterior Galvanized Metal (Industrial)	Epoxy	G1	EG2300	Amerlock 2 VOC	B58W00620	Amerlock 2 VOC	Corotech V155
Exterior Galvanized Metal and Aluminum	Acrylic	G1	ULGM00	4020	B66W01310	6646	HP04
Interior Masonry (Block Filler)	Acrylic	G1	SBPR00	6-15XI	B42W00150	521	571
Interior Gypsum Board with Epoxy Paint Finish	Acrylic	G1	VNSL00	17-921XI	B28 2600 ProMar 200 Zero	971	N534
Zero VOC Interior Gypsum Board	Acrylic	G1	VNSL00	9-900	B28 2600	971/973	N534
Interior Gypsum Board	PVA	G1	VNSL00	6-2	B28 2600	971	N534
Interior Ferrous Metal	Acrylic	G1	BRPR00	4020	B66W01310	6646	HP04
Interior Galvanized Metal and Aluminum	Acrylic	G1	UGPR00 or ULGM00	4020	B66W00001	6646	HP04
FINISHES							
Exterior Galvanized Metal, Aluminum	100 percent Acrylic	G2	SSHL20	76-110XI	A75W51 Solo	1245	447
Exterior Galvanized Metal, Aluminum	100 percent Acrylic	G5	SSHL50	78-811XI	A76W51 Solo	1250	448
Exterior Galvanized Metal (Industrial)	Aliphatic Urethane Enamel	G6	UG3010 VOC	Amershield VOC	Acrolon 100	Amershield VOC	Corotech V500
Interior Masonry and Gypsum Board	Waterborne Epoxy	G5	AG2600	98E-1	B73W00311	98E-1	Corotech V341
Zero VOC Interior Gypsum Board	100 percent Acrylic	G1	SZRO10	9-110XI	B05-1000	1600	536
Zero VOC Interior Gypsum Board	100 percent Acrylic	G3	SWLL30	9-310XI	B09W01051	1610	537
Zero VOC Interior Gypsum Board	100 percent Acrylic	G5	SWLL50	9-510XI	B10W01051	1650	539
Interior Gypsum Board	100 percent Acrylic	G3	SWLL30	589-10	B20W01960	1610	537
Interior Gypsum Board and Masonry	100 percent Acrylic	G5	SWLL50	9-510XI	A76W53 Solo	1650	539
Interior Ferrous Metal, Galvanized Metal, and Aluminum	100 percent High Performance Acrylic	G3	Sierra Performance MetalMax DTM Acrylic Enamel	90-474	B66W01251	2887	V342
Interior Ferrous Metal, Galvanized Metal, and Aluminum	100 percent High Performance Acrylic	G5	Sierra Performance MetalMax DTM Acrylic Enamel	4216	B66W01151	2888	V341
MISCELLANEOUS							
Exterior Heavy Duty Cleaner	Water-Based	N/A	Krud Kutter Gloss-Off	Dura-Prep 88		Devprep 88	Corotech V600
Exterior and Interior Galvanized Metal Etch Prep.	N/A	N/A	Krud Kutter Metal Clean and Etch, Dissco Eco-Prime 100, or Jasco Prep & Prime				

END OF SECTION

SECTION 10 11 00

VISUAL DISPLAY SURFACES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Liquid chalk writing surfaces.

B. Tackboards.

C. Trim, marker tray, and accessories.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 09 22 16 – Non-Structural Metal Framing.

C. Section 09 29 00 – Gypsum Board.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. AA – Designation System for Aluminum Finishes.
2. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
3. ASTM C1396/C1396M – Standard Specification for Gypsum Wallboard.
4. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
5. Porcelain Enamel Institute – Performance Specifications for Porcelain Enamel Chalkboards.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Shop Drawings: Indicate wall elevations, dimensions, joint locations, and special anchorage details. Method of attachment to structure shall be acceptable to Architect.

C. Provide product data on markerboards, tackboards, trim, and accessories.

D. Submit samples under provisions of Division 01.

E. Submit two samples, 4 inches x 4 inches in size, illustrating markerboard and tackboard, materials, finish, color, and texture.

F. Submit manufacturer's installation instructions under provisions of Division 01.

1.5 REGULATORY REQUIREMENTS

A. Conform to flame and smoke rating for markerboards, and vinyl fabric covered tackboards in accordance with ASTM E84.

1.6 MAINTENANCE DATA

A. Submit maintenance data under provisions of Division 01.

B. Include maintenance information on regular cleaning and stain removal.

1.7 WARRANTY

A. Provide “Life of Building” warranty, stating that under normal usage and maintenance, and when installed in accordance with manufacturer’s instructions and recommendations, products are guaranteed for the life of the building. Guarantee covers replacement of defective products, but does not include removal or reinstallation cost.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Claridge Products and Equipment, Inc. Products:
   1. Fixed Markerboards and Tackboards: Series 400, configurations, combinations, and sizes as indicated on Drawings.

B. Aarco Products Inc.

C. Platinum Visual Systems.

D. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Markerboards:
   1. Outer Face Sheet Steel: 24 gauge steel with LCS (porcelain enamel) face.
   2. Aluminum Extrusions: ASTM B221, 6063 alloy, T-5 temper.
      a. Frame: Manufacturer's standard profile; concealed fasteners.
      b. Chalk Tray: Manufacturer's standard profile; one piece, full length of markerboard with end closures; concealed fasteners.
      c. Map Rail: Continuous 1 inch map rail with cork insert and end stops at each end of markerboard.
   3. Core: 7/16 inch Duracore, composed of 100 percent recycled wood fiber.
      a. Binder shall not contain added urea-formaldehyde resins.
   4. Backing: Aluminum sheet.
   5. Adhesives: Type recommended by manufacturer.
   6. Splice Joint: Extruded aluminum exposed "H" type, with chalk surfacing applied.

B. Tackboards:

1. Tackboard Covering: Polyester fabric, Model FR701 as manufactured by Guilford of Maine.
    a. Color: As indicated on Drawings. If not indicated, as selected by Architect.
2. Aluminum Extrusions: ASTM B221, 6063 alloy, T-5 temper.
    a. Frame: Manufacturer's standard profile; concealed fasteners.
3. Core: 7/32 inch cork over 1/4 inch hardboard.
4. Adhesives: Type recommended by manufacturer.
5. Splice Joint: Extruded aluminum “H” type, with fabric wrapped surface.

2.3 FINISHES

A. Porcelain Enamel: Glass-fibered enamel, baked to vitreous surfaces; Porcelain Enamel Institute Type A; color: Claridge No. 100 White.

B. Aluminum Frames and Accessories: Anodized to clear finish.

C. Tackboard Surface: Vinyl wallcovering, color as selected by Architect.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify that surfaces and internal wall blocking are ready to receive work, and opening dimensions are as indicated on shop drawings.

B. Beginning of installation means acceptance of substrate construction.

3.2 INSTALLATION

A. Install markerboards and tackboards where located on the Drawings in accordance with manufacturer's instructions.

B. Secure units level and plumb.

3.3 CLEANING

A. Clean markerboard and tackboard surfaces in accordance with manufacturer's instructions.

END OF SECTION

SECTION 10 14 00

SIGNAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior Signages:
   1. Accessibility Signage.
   2. Vinyl Applied Graphics.
   3. Metal Dimensional Characters.

B. Interior Signages:
   1. Accessibility Signage.
   2. Vinyl Applied Graphics.
   3. Metal Dimensional Characters.

C. Metal Dedication Plaques.

D. Life Safety Signages.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 04 22 00 – Concrete Unit Masonry.

C. Section 08 11 13 – Hollow Metal Doors and Frames.

D. Section 08 14 00 – Wood Doors.

E. Section 09 29 00 – Gypsum Board.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:
   1. ADA – Americans with Disabilities Act - 2010 Standards for Accessible Design.
   2. ASTM A53/A53M – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   3. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

4. ASTM A283/A283M – Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
5. ASTM A500/A500M – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
6. ASTM B26/B26M – Standard Specification for Aluminum-Alloy Sand Castings.
7. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
8. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
9. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
10. ASTM F593 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
11. AWS D1.1 – Structural Welding Code – Steel.
12. AWS D1.2 – Structural Welding Code – Aluminum.
13. 2022 California Building Code (CBC).
14. NFPA 80, 4.1.4 – Signage on Fire Doors.
15. NFPA 101 – Life Safety Code.
16. UL 924 – Emergency Lighting and Power Equipment.
17. UL Building Materials Directory.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data: Submit manufacturer's descriptive literature and product specification for each product.

C. Shop Drawings: Submit shop drawing for each sign and plaque to show construction, sections, text, character spacing, and mounting details.

D. Samples: Submit sign and plaque colors, finishes, designs, and sizes as specified in this Section and as shown on the Drawings for review.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section with a minimum five years' experience.

B. Regulatory Requirements:

1. Accessibility Signage, General: Provide signage in accordance with California Code of Regulations, Title 24, Part 2, Chapter 11B, Sections 11B-216 and 11B-703, 2022 California Building Code.
    a. Finish, Color, and Contrast: Characters, pictograms, symbols and their backgrounds shall have a non-glare finish. Characters shall contrast with their background with either light characters on a dark background or dark characters on a light background.
    b. Depth: Raised characters shall be 1/32 inch minimum above their background.

c. Case:

1) Raised Characters: Characters shall be uppercase.

2) Visual Characters: Characters shall be uppercase or lowercase or a combination of both.

d. Style: Characters shall be conventional in form. Characters shall not be italic, oblique, script, highly decorative, or of other unusual forms. Raised characters shall be sans serif.

e. Proportions: Visual characters on signs shall be selected from fonts where the width of the uppercase letter “O” is 60 percent minimum and 110 percent maximum of the height of the uppercase letter “I”. Stroke thickness of the uppercase letter “I” shall be 15 percent maximum of the height of the character.

f. Character Height:

1) Raised Characters: Character height measured vertically from the baseline of the character shall be 5/8 inch minimum and 2 inches maximum based on the height of the uppercase letter “I”. Stroke thickness of tactile characters shall be 15 percent maximum of the height of the character.

2) Visual Characters: Minimum character height shall comply with CBC Table 11B-703.5.5. Viewing distance shall be measured as the horizontal distance between the character and an obstruction preventing further approach towards the sign. Character height shall be based on the uppercase letter “I”.

g. Character Spacing:

1) Raised Characters: Character spacing shall be measured between the two closest points of adjacent raised characters within a message, excluding word spaces. Where characters have rectangular cross sections, spacing between individual raised characters shall be 1/8 inch minimum and four times the raised character stroke width maximum, Where characters have other cross sections, spacing between individual raised characters shall be 1/16 inch minimum and four times the raised character stroke width maximum at the base of the cross sections, and 1/8 inch minimum and four times the raised character stroke width maximum at the top of the cross sections. Characters shall be separated from raised borders and decorative elements 3/8 inch minimum. Spacing between individual tactile characters shall comply with CBC Section 11B-703.2.7 and Section 11B-703.2.8.

2) Visual Characters: Character spacing shall be measured between the two closest points of adjacent characters, excluding word spaces. Spacing between individual characters shall be 10 percent minimum and 35 percent maximum of character height.

h. Line Spacing: Spacing between the baselines of separate lines of characters within a message shall be 135 percent minimum and 170 percent maximum of the character height.

i. Format: Text shall be in horizontal format.

j. Braille: Comply with CBC Section 11B-703.3, contracted Grade 2 Braille.

1) Dimensions and Capitalization: Braille dots shall have a domed or rounded shape and shall comply with CBC Table 11B-703.3.1. The indication of an uppercase letter or letters shall only be used before the first word of sentences, proper nouns and names, individual letters of the alphabet, initials, and acronyms.

2) Position: Braille shall be positioned below the corresponding text in a horizontal format, centered under text. If text is multi-lined, Braille shall be placed below the entire text. Braille shall be separated 3/8 inch minimum and 1/2 inch maximum from any other tactile characters and 3/8 inch minimum from raised borders and decorative elements.

k. Pictograms: Comply with CBC Section 11B-703.6.

1) Pictogram Field: Pictograms shall have a field height of six inches minimum. Characters and Braille shall not be located in the pictogram field.

2) Text Descriptors; Pictograms shall have text descriptors located directly below the pictogram field. Text descriptors shall comply with CBC Sections 11B-703.2, 11B-703.3, and 11B-703.4.

l. Symbols of Accessibility: Symbols of accessibility shall comply with CBC Section 11B-703.7.

m. Edges and verticals on geometric symbols shall comply with CBC Section 11B-703.7.2.6.4.

2. Accessibility Signage:

a. Tactile Exit Signage: CBC Chapter 10 “Means of Egress,” Section 1013 “Exit Signs,” Section 1013.1 “Where Required,” and Section 1013.4 “Raised Character and Braille Exit Signs”.

1) Tactile signs required by CBC Section 1013.4 need not be provided with illumination per Section 1013.3.

2) Tactile Stairway Signs (SFM Requirement): CBC Section 1023.9 “Stairway Identification Signs”.

b. Other Accessible Signage: CBC Chapter 11B, “Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.”

1) Toilet Room and Bathing Room Signage: CBC Section 11B-216.8, ‘Toilet Rooms and Bathing Rooms” and CBC Section 11B-703.7.2.6, “Toilet and Bathing Facilities Geometric Symbols”.

2) Assistive Listening Symbol: CBC Section 11B-216.10, “Assistive Listening Systems” and Section 11B-703.7.2.4, “Assistive Listening Systems”. Assistive Listening System signs shall be provided at all assembly areas, as defined in CBC Chapter 2.

3) Detailed Requirements for Accessible Signage: CBC Chapter 11B, Division 7, Section 11B-703, “Signs”.

a) Sign Mounting Heights and Locations: CBC Sections 11B-703.4, 11B-703.5.6, and 11B-703.7.2.6.

b) Symbols of Accessibility: CBC Section 11B-703.7, “Symbols of Accessibility”.

c) International Symbol of Accessibility: CBC Section 11B-703.7.2.1, “International Symbol of Accessibility”.

d) Entrance Signs: CBC Section 11B-216.6, “Entrances”.

4) Site Accessibility Signage: CBC Sections 11B-216, “Signs”, 11B-502.6, “Identification”, 11B-502.8, “Additional Signs”, and 11B-703, “Signs”.

5) Accessible Parking Signage: CBC Section 11B-502.6 “Identification”.

6) Post or Pylon Mounted Signs: CBC Section 11B-307.3 “Post-Mounted Objects”.

c. Field Inspection: Signs and identification shall be field inspected after installation and approved by the enforcing agency, in accordance with CBC Section 11B-703.1.1, “Plan Review and Inspection”.

3. Exit Signage: Provide signage in accordance with California Code of Regulations, Title 24, Part 2, 2022 California Building Code, Chapter 10 “Means of Egress”, Section 1013 “Exit Signs”, as applicable to Occupancy Group.

a. Illuminated Exit Signs: CBC Section 1013.1 “Where Required”, Section 1013.3 “Illumination”, Section 1013.5 “Internally Illuminated Exit Signs”, and Section 1013.6 “Externally Illuminated Exit Signs”.

b. Floor Exit Signs (SFM Requirement): CBC Section 1013.7 “Floor-Level Exit Signs”.

4. Wind Load Requirements: Exterior signages shall be designed to resist wind loads in accordance with CBC.

C. Pre-Installation Meetings:

1. Conduct pre-installation meeting in accordance with provisions of Division 01.
2. Convene pre-installation meeting one week prior to commencing work of this Section.
3. Coordinate work in this Section with work in related Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Storage and Protection: Store materials in a dry secure place. Protect from weather, surface contaminants, corrosion, construction traffic, and other potential damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. WeidnerCA, Sacramento, CA; phone: 916-452-8000, URL: www.weidnerca.com.
2. ASI-Modulex, Dallas, TX; phone: 800-274-7732, URL: www.asisign.com.
3. In Pro Corporation, Muskego, WI; phone: 800-222-5556, URL: www.inprocorp.com.
4. Mohawk Sign Systems, Inc., Schenectady, NY; phone: 518-842-5303, URL: www.mohawksign.com.
5. APCO, Atlanta, GA; phone: 404-688-9000, URL: www.apcosigns.com.
6. Diverse ID, Tampa, FL; phone: 877-446-2374, URL: www.diverseid.com.

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Acrylic Plastic: Non-glare finish acrylic with integral color as manufactured by Romark, Rohm and Haas, CYRO Industries Acrylite FF, or accepted equal. Thickness shall be 1/4 inch at door mounted geometric symbols and 1/8 inch minimum at all other locations, unless noted otherwise. Colors as selected by Architect from manufacturer’s full range of colors.

B. Aluminum: ASTM B209 for sheet or plate; ASTM B221 for extrusions, and ASTM B26/B26M for castings. Aluminum extrusions shall be 1/8 inch thick minimum. Wall and post mounted panels shall be 0.080 inch thick minimum. Aluminum panels shall have a non-glare acrylic polyurethane paint finish.

C. Steel Posts: ASTM A53/A53M, Type E or S, Grade B; galvanized 1-1/2 inch nominal pipe size (NPS), Schedule 40. Provide 1/8 inch thick steel cap (ASTM A283/A283M) welded to top of post. Galvanize post and cap to minimum G50 in accordance with ASTM A123/A123M.

D. Vinyl Sheet for Graphics: Precision cut; five year to seven year premium type; shall be in accordance with flammability requirements of ASTM E84; minimum 0.003 inch film thickness. Film shall include a precoated pressure sensitive adhesive backing or positionable pressure sensitive backing. Film shall be 3M Scotchcal, Orafol Oracal 651 Intermediate Calendered Film, or accepted equal. Colors as selected by Architect.

E. Anchors and Fasteners: Stainless steel conforming to ASTM F593.

2.3 EXTERIOR SIGNAGE

A. Accessible Signage: Provide the following signages in accordance with 2010 ADA Standards for Accessible Design and 2022 CBC where indicated on the Drawings.

1. Entrance to Parking Lot Sign: 17 inches wide by 22 inches high (minimum) metal panel, reflectorized sign mounted on a single post with text “UNAUTHORIZED VEHICLES PARKED IN DESIGNATED ACCESSIBLE SPACES NOT DISPLAYING DISTINGUISHING PLACARDS OR SPECIAL LICENSE PLATES ISSUED FOR PERSONS WITH DISABILITIES WILL BE TOWED AWAY AT OWNERS EXPENSE. TOWED VEHICLES MAY BE RECLAIMED AT _____ OR BY TELEPHONING _____.”
   a. Blank Space Text: Coordinate text requirement for blank spaces with Owner.
2. Accessible Parking Stall Sign: Provide a 12 inch wide by 18 inch high metal panel, reflectorized International Symbol of Accessibility sign, mounted on a single post, at every accessible parking stall indicated on the Drawings. Text shall occur below the symbol and read “PARKING ONLY”.
3. Van Accessible Parking Stall Sign: Provide a 12 inches wide by 18 inches high metal panel, reflectorized International Symbol of Accessibility sign, mounted on a single post for each van accessible parking stall as indicated on the Drawings. Text shall occur below the symbol and read “PARKING ONLY”. Mounted on the same post, below this sign, a sign of the same width and required height shall display the text “VAN ACCESSIBLE”. Refer to Drawings for additional sign information.
4. Sign for Parking Violation Fine: An additional sign or additional language below the symbol of accessibility shall state “Minimum Fine $250”.
5. Functional Room Signage: Provide acrylic plastic room signage with inlaid characters raised 1/32-inch, upper case, sans serif type with corresponding contracted Grade 2 Braille. Raised characters shall be at least 5/8 inch high, but no higher than 2 inches. Color selections from manufacturer’s full range of colors. Characters and symbols shall contrast with their background per CBC Section 11B-703.

B. No Smoking Signage: Provide no smoking signage. Text for signs:

1. “NO SMOKING WITHIN 25 FEET OF BUILDING”.

2. “DESIGNATED SMOKING AREA”.

C. Exterior Metal Dimensional Characters:

1. Manufacturers:
   a. Vomar.
   b. Gemini Sign Letters.
   c. Or accepted equal.
2. Material: ASTM B26/B26M #514 alloy cast aluminum.
3. Size: As indicated on Drawings.
4. Font: Helvetica Medium, all capital letters, 1-1/2 inches thick.
5. Characters Required: Refer to Drawings.
6. Finish: Class I clear anodized finish.

2.4 INTERIOR SIGNAGE

A. Accessible Signage: Provide the following signages in accordance with 2010 ADA Standards for Accessible Design and 2022 CBC where indicated on Drawings:

1. Material: Acrylic plastic, edges rounded, chamfered, or eased. Corners shall have minimum radius of 1/8 inch.
2. Color: Characters, symbols, and pictograms on contrasting background per CBC Section 11B-703. Colors as selected by Architect from manufacturer’s full range of colors.
3. Restroom Signage:
   a. Unisex Restroom Symbol (door mounted): Provide for each unisex restroom door a circle, 1/4 inch thick and 12 inches in diameter with a 1/4 inch thick equilateral triangle with a vertex pointing upward superimposed on the circle and within the 12 inch diameter. The triangle symbol shall contrast with the circle, either light on a dark background or dark on a light background. The circle symbol shall contrast with the door color, either light on a dark background or dark on a light background.
   b. Unisex Restroom Sign (wall mounted): Provide for each unisex restroom a 6 inch wide by 10 inch high acrylic plaque, with an international symbol of accessibility centered at the top of the sign; 1 inch high by 1/32 inch raised text below to read “RESTROOM”; with corresponding contracted Grade 2 Braille 3/8 inch minimum to 1/2 inch maximum below text.
4. Functional Room Signage: Provide room signage with inlaid characters raised 1/32-inch, upper case, sans serif type with corresponding contracted Grade 2 Braille. Raised characters shall be at least 5/8 inch high, but no higher than 2 inches. Characters and symbols shall contrast with their background per CBC Section 11B-703.
5. Assistive Listening Signage: Provide sign notifying availability of assistive listening system, 13 inch wide by 8 inch high acrylic plaque with international symbol of access for hearing loss in compliance with CBC Figure 11B-703.7.2.4 imprinted centered at the top of the sign and characters below with text “ASSISTIVE LISTENING SYSTEM AVAILABLE”.
6. Tactile Exit Signage:
   a. Provide tactile exit signs at doors in rooms or areas that require more than one exit or exit access per CBC Sections 1013.1 and 1013.4.

b. Acrylic plaque tactile exit signs shall have text at least 5/8 inch high, but no higher than 2 inch high, and corresponding contracted Grade 2 Braille shall be placed a minimum of 3/8 inch and a maximum of 1/2 inch directly below the text as follows:

1) Each grade-level exterior exit door that is required to comply with CBC Section 1013.1 shall be identified by a tactile exit sign with the word “EXIT”.

2) Each exit door that is required to comply with CBC Section 1013.1, and that leads directly to a grade-level exterior exit by means of a stairway or ramp shall be identified by a tactile exit sign with the following words as appropriate: “EXIT STAIR DOWN”, “EXIT RAMP DOWN,” “EXIT STAIR UP,” or “EXIT RAMP UP.” At exit discharge level, door sign shall include a raised five-pointed star located to the left of the identifying floor level.

3) Each exit door that is required to comply with CBC Section 1013.1, and that leads directly to a grade-level exterior exit by means of an exit enclosure or an exit passageway shall be identified by a tactile exit sign with the words “EXIT ROUTE”.

4) Each exit access door from an interior room or area to a corridor or hallway that is required to comply with CBC Section 1013.1 shall be identified by a tactile exit sign with the words “EXIT ROUTE”.

5) Each exit door through a horizontal exit that is required to comply with CBC Section 1013.1 shall be identified by a tactile exit sign with the words “TO EXIT”.

B. Interior Metal Dimensional Characters:

1. Manufacturers:
   a. Vomar.
   b. Gemini Sign Letters.
   c. Or accepted equal.
2. Material: ASTM B26/B26M #514 alloy cast aluminum.
3. Size: As indicated on Drawings.
4. Font: Helvetica Medium, all capital letters, 1-1/2 inches thick.
5. Characters Required: Refer to Drawings.
6. Finish: Class II clear anodized finish.

2.5 METAL DEDICATION PLAQUES

A. As part of the Base Bid amount, include the sum of $3000.00 to provide and install a metal wall mounted dedication plaque.

2.6 LIFE SAFETY SIGNAGE

A. Exit Signs: Internally illuminated exit signs conforming to NFPA 101, Section 7.10.7; UL listed in accordance with UL 924, with wording in legible characters not less than 4 inch high and text “EXIT”.

2.7 FABRICATION

A. Work shall be assembled in the shop, as far as practical, ready for installation at the site. Work that cannot be shop assembled be trial fit in the shop to ensure proper field assembly.

B. Drill or punch holes for bolts and screws; produce clean, true lines and surfaces.

C. Acrylic signs shall have inlaid acrylic copy/characters and Braille symbols as described in this Section.

D. Aluminum welding shall be in accordance with AWS D1.2. Steel welding shall be in accordance with AWS D1.1. Welding shall be continuous along the entire area of contact. Grind smooth exposed welds.

E. Galvanized items shall be hot-dip process after fabrication if practical in accordance with ASTM A123/A123M.

F. Exposed work surfaces shall have a smooth finish and exposed riveting shall be flush. Fastenings shall be concealed where practical.

G. Joints exposed to the weather shall be formed to exclude water. Provide drainage and weep holes to prevent condensation buildup.

2.8 SHOP FINISHING

A. Surfaces of miscellaneous metal work, except nonferrous metal, corrosion resisting steel, and zinc-coated work, shall be given one coat of zinc-molybdate primer or an accepted rust-resisting treatment and metallic primer in accordance with manufacturer's standard practice.

B. Surfaces to be embedded in concrete shall not be painted.

C. Upon completion of work, damaged surfaces shall be recoated.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install signs and plaques level and plumb.

B. Mount sign posts directly into concrete foundation. Mount sign to post using tamper resistant mechanical fasteners as recommended by manufacturer and accepted by the Architect.

C. Accessible Sign Mounting Heights and Locations:

1. Site Signage:

a. Parking Signage: Per CBC Section 11B-502.6, signs not located within a circulation path shall be 60 inches minimum above the finish floor or ground surface measured to the bottom of the sign.

2. Mounting Height With Tactile Characters: Per CBC Section 11B-703.4.1, tactile characters on signs shall be located 48 inches minimum above the finished floor or ground surface, measured from the baseline of the lowest Braille cells and 60 inches maximum above the finished floor or ground surface, measured from the baseline of the highest line of raised characters.

3. Mounting Location with Tactile Characters: Per CBC Section 11B-703.4.2 as follows:

a. Where a tactile sign is provided at a door, the sign shall be located alongside the door at the latch side.

b. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located on the inactive leaf.

c. Where a tactile sign is provided at double doors with two active leafs, the sign shall be located to the right of the right hand door.

d. Where there is no space at the latch side of a single door or at the right side of double doors, signs shall be located on the nearest adjacent wall.

e. Signs containing tactile characters shall be located so that a clear floor space of 18 inches minimum by 18 inches minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.

f. Where permanent identification signage is provided for rooms and spaces, they shall be located on the approach side of the door as one enters the room or space. Signs that identify exits shall be located on the approach side of the door as one exits the room or space.

4. Mounting Height With Visual Characters: Per CBC Section 11B-703.5.6, visual characters shall be 40 inches minimum above the finished floor or ground.

5. Toilet and Bathing Facility Signage: Per CBC Section 11B-703.7.2.6, the geometric door symbol shall be mounted at 58 inches minimum and 60 inches maximum above the finished floor or ground surface measured from the centerline of the symbol. The symbol shall be mounted within 1 inch of the vertical centerline of the door.

D. Metal Dimensional Characters and Metal Dedication Plaques: Mount to substrate with metal studs threaded into sign and epoxy into holes drilled in CMU.

E. Exterior Functional Room Signs and No Smoking Signs: Mount to exterior door and wall surfaces using tamper proof stainless steel mechanical fasteners suitable for the mounting substrate as recommended by the manufacturer and accepted by the Architect.

F. Interior Restroom Signs, Functional Room Signs, Tactile Exit Signs, and Assistive Listening Signs: Mount to door and wall surfaces with double faced adhesive foam tape strips and silicone adhesive.

1. Glass Mounted Signs: Apply acrylic sign to glass surfaces using double faced adhesive foam tape strips. Install same size, thickness, and color acrylic blank backer on opposite side of exterior sign using double faced adhesive foam tape strips.

G. Interior and Exterior Vinyl Door Graphics: Install per manufacturer’s recommendations.

3.2 ADJUST AND CLEAN

A. Clean and Touch-up: Remove all packing and protection blemishes and thoroughly clean and polish all finish surfaces. Restore any marred or abraded surfaces to their original condition by touching up in accordance with the manufacturer's recommendations. Touch-up shall not be obvious.

B. Defective Work: Remove and replace all defective work that cannot be properly repaired, cleaned or touched-up, as directed by the Architect, with no additional cost to the Owner.

C. Protect installed work during the construction period to prevent abuse and damage.

3.3 CLEAN-UP

A. Upon completion of the work of this Section, remove all surplus materials, rubbish, and debris from the premises.

END OF SECTION

SECTION 10 21 16.19

PLASTIC TOILET PARTITIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Plastic partitions at detention toilet areas with steel supports.

B. Plastic pilasters and modesty panels (doors) at detention showers.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 04 22 00 – Concrete Unit Masonry.

C. Section 05 50 00 – Metal Fabrications: Steel support posts.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
2. ASTM D635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
3. ASTM D1929 – Standard Test Method for Determining Ignition Temperature of Plastics.
4. ASTM D2843 – Standard Test Method for Density of Smoke From the Burning or Decomposition of Plastic.
5. NFPA 286 – Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.4 SUBMITTALS

A. General: Submit under provisions of Division 01.

B. Samples:

1. Furnish three 1 inch x 4 inch samples of solid plastic partition material showing face and finished edges in selected color and texture.
2. Furnish one each of stainless steel fasteners, door hardware, and mounting hardware.

C. Shop Drawings:

1. Provide four copies of all shop drawings.

2. Show fabrication, erection and anchorage of assemblies, to extent not fully described by manufacturer's data sheets.
3. Show anchorage, accessory items and finishes.
4. Show compartment layouts, with field verified dimensions.
5. Provide location drawings for bolt hole locations in supporting members for attachment of partitions.

D. Manufacturer’s Data:
1. Provide four copies each of:
a. Data sheets.
b. Installation instructions.
c. Maintenance procedures.
d. Independent third party test results certifying that partitions pass NFPA 286 requirements.

1.5 REGULATORY REQUIREMENTS

A. Comply with CBC Chapter 11B accessibility requirements.

B. Flammability Test: Meet the requirements of CBC Chapter 8; passes NFPA 286 test requirements.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver items in manufacturer's original unopened protective packaging.

B. Store materials in original protective packaging to prevent soiling, physical damage, or wetting.

C. Handle so as to prevent damage to finished surfaces.

1.7 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.8 COORDINATION

A. Coordinate placement of backing in walls. Backing by others.

1.9 WARRANTY

A. Twenty-five year warranty covering all plastic components against breakage, corrosion, and delamination.

B. Five year warranty for all hardware.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
1. Scranton Products.

2. Partition Systems Incorporated of South Carolina (PSISC).
3. Bradley, Sentinel Series 400.
4. ASI Global Partitions.

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. High-density polyethylene (HDPE) plastic shall meet the requirements of ASTM D1929 and ASTM D2843.

B. Pilasters, doors, and panels shall be fabricated from high-density polyethylene (HDPE) containing a minimum of ten percent recycled material manufactured under high pressure forming a single component section which is waterproof, nonabsorbent and that has a self-lubricating surface.

1. Texture: Orange Peel.
2. Color: As indicated on Drawings.

C. Pilaster shoes shall be 20 gauge Type 304 stainless steel with #4 satin brushed finish.

2.3 FABRICATION

A. Pilasters and doors shall be 1 inch thick. All edges shall be machined to a radius of 0.250 inch. All exposed surfaces shall be free of saw marks.

1. Panel and door sizes shall be as shown on Drawings.
2. Pilasters shall be full height as shown on Drawings.

B. Panels and doors shall be 58 inches high and mounted 12 inches above finished floor, unless noted otherwise on Drawings.

C. Leveling devices shall be through-bolted to base of pilaster.

D. Pilaster shoes shall be one-piece, 3 inches high minimum. Top shall have 90 degree return to pilaster. Shoes shall be secured to pilasters with stainless steel tamper resistant torx head sex bolts.

2.4 HARDWARE

A. Door Hardware:

1. Door strike/keeper shall be 6 inches long and made of 6463-T5 alloy extruded aluminum with bright dip anodized finish. Bumper shall be made of extruded black vinyl.
2. Hinges shall be integral, fabricated from the door and pilaster with no exposed metal parts.
3. Door shall be furnished with two 11 gauge stainless steel door stop plates with attached rubber bumpers to resist door from being kicked in/out beyond pilaster.
4. Provide U-shaped door pulls and wall stop for outswinging doors. Equip doors with inside and outside pulls. Door hardware shall be mounted at 30 inches to 44 inches above finished floor.

B. Miscellaneous Hardware:

1. Provide 1-1/2 inch stirrup type 6463-T5 alloy aluminum wall brackets with bright dip anodized finish. Brackets shall be used for all panels to pilaster, pilasters to wall and panel to wall connections. Wall brackets shall be thru-bolted to panels and pilasters with stainless steel tamper resistant torx fasteners.

   a. Provide full length brackets at all panel to pilaster, panel to wall, and panel to post connections.

2. Fasteners at locations connecting panels to pilasters shall utilize through-bolted, stainless steel, tamper resistant torx fasteners.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that site conditions are ready to receive work and opening dimensions are as required.

B. Verify correct spacing of plumbing fixtures.

C. Verify correct location of built-in framing, anchorage and bracing, where required.

D. Beginning of installation means acceptance of existing substrate.

3.2 INSTALLATION

A. Install partitions secure, plumb, and level in accordance with manufacturers' instructions.

B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to bracket with tamper resistant bolts and nuts.

E. Secure all elements rigidly in place. Anchor to structure with anchors appropriate for use with type of adjacent construction. Fasteners shall securely fasten items to wall construction involved. Fasteners shall provide stiffness and rigidity to keep items square, in accurate position without twisting, buckling or warping. Fasteners to framing substrate shall be the following minimums; greater as required by the toilet partition manufacturer or as conditions warrant:

   1. Masonry: 1/4 inch diameter tamper resistant stainless steel wedge anchors with 1-1/2 inch minimum embedment into substrate and 2 inch minimum edge distance to face of substrate.

F. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster. Conceal floor fastenings with pilaster shoes.

G. Adjust hinges to locate doors in partial opening position. Hinges shall return outswinging doors to closed position.

3.3 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Set hinge on out-swinging doors to hold door in closed position.

3.4 CLEANING

A. Remove protective masking. Clean surfaces.

B. Field touch-up of scratches or damaged finish will not be permitted.

C. Replace damaged or scratched materials with new materials.

END OF SECTION

SECTION 10 21 23.16

CUBICLE TRACK AND CURTAIN

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cubicle curtains.

B. Curtain tracks, curtain carriers, and associated hardware.

1.2 RELATED SECTIONS

A. Section 09 29 00 – Gypsum Board.

B. Section 09 51 13 – Acoustical Panel Ceilings.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. NFPA 13 – Standard for the Installation of Sprinkler System.
2. NFPA 701 – Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
3. UL 214 – Standard for Tests for Flame-Propagation of Fabrics and Films.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data: Submit manufacturer’s descriptive literature and product specification.

C. Shop Drawings: Submit a reflected ceiling plan view of curtain track. Submit details showing hangers, suspension points, and attachments.

1. Suspended ceiling components.
2. Structural members to which suspension system will be attached.
3. Indicate location of items penetrating finished ceiling, including but not limited to lighting fixtures, air outlets, speakers, sprinklers, access panels.

D. Samples:

1. Curtain track, 12 inches long, including typical splice, curtain carrier, and end stops.
2. Curtain fabric, 12 inches square, minimum.

E. Submit manufacturer's installation instructions. Include special procedures, perimeter conditions requiring special attention.

1.5 PERFORMANCE REQUIREMENTS

A. Track: Provide track with the following characteristics:

1. Support vertical test load of sixty pounds without visible deflection of track or damage to supports.
2. Size: Safely support moving loads.
3. Mounting: Sufficiently rigid to resist visible deflection and without permanent set.

B. Curtains: Provide curtain fabric with the following characteristics:

1. Fabrics shall be flame resistant that have passed NFPA 701 when tested by an independent third party testing and inspecting agency acceptable to Authorities Having Jurisdiction.
2. Identify fabrics with appropriate markings of applicable testing and inspecting agency.

1.6 REGULATORY REQUIREMENTS

A. Regulatory Requirements for Curtains: Comply with California Fire Code, Title 24, Part 9, Section 807, Article 807.2, “Combustible Decorative Materials” requirements.

B. Requirements for Sprinkler Discharge (Light Hazard Occupancy): Open area (mesh) and installation of curtains shall conform to NFPA 13, Chapter 8 “Installation Requirements,” Article 8.6.5.2 “Obstructions to Sprinkler Discharge pattern Development,” subparagraph 8.6.5.2.2.1. Refer to other Articles as applicable to design conditions.

1. Mesh Requirements: Mesh shall have seventy percent open area and extend 22 inches, minimum, from the ceiling.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tracks until spaces are enclosed and waterproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Storage and Protection: Store materials in a dry secure place. Protect from weather, surface contaminants, corrosion, construction traffic, and other potential damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Imperial Privacy Systems, Pompano Beach, FL; 954-782-7130, www.imperialprivacy.com. Products:
   a. Break-A-Way tracks shall be Model IFC-69 ceiling mounted track.
   b. Sure Check curtains.

c. Safety tabs.

2. InPro Corporation, Muskego, WI; 800-222-5556, www.inprocorp.com.
3. General Cubicle Company, Inc., Cranford, NJ; 800-869-4606, www.generalcubicle.com.

B. Substitutions: Under provisions of Division 01.

2.2 TRACKS

A. Extruded Aluminum Track: Track shall be extruded 6063-T5 aluminum, 1-7/16 inch by 1-9/16 inch by 0.062 inch wall thickness, one piece, ceiling mounted.

1. Curved Track: Factory-fabricated with 12 inch radius bends.
2. Finish: Satin anodized.

B. Track Accessories: Safety Tabs, 4 inch long and 3/4 inch wide. Provide three Safety Tabs per foot of track.

2.3 TRACK FABRICATION

A. Track Fabrication: Fabricate splices, end caps, connectors, end stops, coupling and joining sleeves, wall flanges, brackets, ceiling clips, and other accessories from same material and with same finish as track.

1. Curved Track: Provide curved track where indicated on Drawings. Fabricate track bend with minimum 12 inches radius, without deforming track section, or impeding movement of carriers.
2. Fasteners: Provide stainless steel fasteners.

2.4 CURTAINS

A. Curtain Fabric: Curtain manufacturer's standard, nylon reinforced vinyl, inherently and permanently flame resistant, stain resistant, antimicrobial, self-deodorizing, self-sanitizing, anti-static, odor resistant, and tear resistant.

1. Flame Resistance: Complies with NFPA 701, Test Method 1 requirements.
2. Color: As selected by Architect from manufacturer’s full range of colors.

B. Mesh Top: No. 50, 20 inches wide, 1/2 inch hole nylon mesh.

1. Color: As selected by Architect from manufacturer’s standard colors.

2.5 CURTAIN FABRICATION

A. Fabricate curtains to comply with the following requirements:

1. Width equal to track length from which curtain is hung plus 6 inches added fullness.
2. Length: Equal to floor-to-ceiling height minus 22 inches from finished ceiling at top, and minus distance above the finished floor at bottom as follows:

a. Shower Curtain: 12 inches

3. Top Hem: 1-1/2 inch wide and double lock stitched and 1-1/2 inch wide loop tape double lock stitched to top hem.
4. Mesh Top: Top hem shall be 1-1/2 inches wide, triple thickness, reinforced with integral web, and double lock stitched. Double lock stitch bottom of mesh directly to 1/2-inch triple thickness, top hem of curtain fabric.
5. Side Hems: Double-turned, 1-1/2 inch wide, consisting of three layers of fabric, blind-stitched.

6. Bottom Hem: Double-turned, 1-1/2 inch wide, consisting of three layers of fabric, weighted and blind-stitched.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine job site conditions and verify field dimensions. Verify substrate is level and ready to receive work.

B. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 INSTALLATION

A. Install in accordance with manufacturer's printed instructions and approved shop drawings.

B. Install units secure, rigid, and level and free from warp or twist while maintaining dimensional tolerances and alignment with adjacent surfaces.

C. Curtain Track Mounting: Provide surface-mounting, unless otherwise indicated on Drawings. Mechanically fasten track assembly to suspended ceiling grid or framing, as indicated. Provide support brackets and fittings as required for rigid installation.

1. Surface Mounting: Install fasteners at no less than 24 inches on center with a No. 8 pan head screw or toggle bolt, as required. Position fasteners in the center of raceway to ensure that the carrier bypasses the screw head.

D. Install one-piece track sections wherever possible. Splice only where one-piece sections do not apply.

E. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.

F. Install carrier stops at the ends of tracks or bends, non-removable and removable, as required.

G. Curtains: Hang curtains on each curtain track; install curtains so that bottom hems clear finished floor by clearances indicated in this Section.

H. Curtain Safety Tabs: Provide Safety Tabs adequate for 4 inch spacing along full length of curtain.

3.3 ADJUSTING

A. After hanging curtains, test and adjust each track to produce unencumbered, smooth operation.

B. Remove and replace curtains that are stained or soiled.

3.4 CLEANING

A. Clean track assembly as recommended by manufacturer. Do not use materials or methods which may damage finish surface or surrounding construction.

END OF SECTION

SECTION 10 26 00

WALL AND DOOR PROTECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall guards.

B. Corner guards.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 09 22 16 – Non-Structural Metal Framing.

C. Section 09 29 00 – Gypsum Board.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

2. ASTM D2240 – Standard test Method for Rubber Property – Durometer Hardness.

3. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Submit manufacturer's descriptive literature and product specification for each product.

C. Shop Drawings: Indicate typical layout including dimensions and mounting details.

D. Samples:

1. Three 12 inch long wall and corner guards in selected color and texture.
2. Three 6 inch x 6 inch samples of wall protection sheet in selected color and texture.
3. Three fasteners.

E. Quality Assurance/Control Submittals:

1. Manufacturer’s Installation Instructions.

F. Closeout Submittals:

1. Cleaning and maintenance data.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this

B. Pre-Installation Meetings:

1. Conduct pre-installation meeting in accordance with provisions of Division 01.
2. Convene pre-installation meeting one week prior to commencing work of this Section.
3. Coordinate work in this Section with work in related Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Storage: Store materials in a cool and dry location, elevated from the ground and protected from the elements.

1.7 SEQUENCING

A. Install wall and corner guards after application of wall finishes.

1.8 MAINTENANCE

A. Submit cleaning and maintenance data.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Pawling Corporation.
2. Construction Specialties, Inc.
3. InPro Corporation.

B. Substitutions: Under provisions of Division 01.

2.2 WALL GUARDS

A. Pawling Style WG-6.

1. Properties:

a. Extruded high impact vinyl with embossed matte finish.

b. Shore D Hardness: 79 minimum per ASTM D2240.
c. Size: 6 inches high x 1 inch deep x 0.100 inch thick.
d. Color: As indicated on Drawings.
e. Flammability (ASTM E84): Class A.

2. Accessories:
a. Matching end caps and outside corner caps.
b. Splice splines: Six inches long, installed at all wall guard splices – Pawling No. D-2.
c. Retainer: Continuous 6063-T5 mill finish aluminum in conformance with ASTM B221, 0.080 inches thick, with continuous flexible impact cushion.
d. Fasteners: 1/4 inch by 2 inch Torx security concrete screws, hex washer head, Perma-Seal coated carbon steel.

2.3 CORNER GUARDS

A. Pawling Pro-Tek Model CG-50-4.
1. Properties:
a. Material: 16 gauge Type 304 stainless steel with #4 satin finish.
b. Size: 3-1/2 inches x 3-1/2 inches x 4 feet x 90 degrees with 1/8 inch nose radius.
2. Accessories:
a. Mechanical Fasteners: Flat head stainless steel Torx screws.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive items and verify following:
1. Dimensions are correct to receive items.
2. Adjacent or adjoining surfaces are clean, dry, reasonably smooth, and free from defects.
3. Absence of other conditions that will adversely affect installation.

B. Inspect gypsum board wall on metal stud assembly to verify that a 5 inch, minimum 16 gauge galvanized metal backing is installed behind gypsum board to receive mechanical fasteners.

C. Report unacceptable conditions to the Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 PREPARATION

A. Condition wall and corner guards to room climate 48 hours before installation.

B. Clean surfaces to receive wall and corner guards. Walls to receive adhesive must be free from dirt, oil, and moisture.

3.3 INSTALLATION – WALL GUARDS

A. Install in accordance with manufacturer’s printed instructions and accepted shop drawings.

B. Install double row of wall guards as indicated on Drawings.

C. Install wall guards level, square, and free from warp or twist while maintaining dimensional tolerances and alignment with adjacent surfaces.

D. Install fasteners at 16 inches on centers – offset. Use proper diameter Torx drill bit. Drill hole into the substrate 1/2 inch deeper than the required embedment. Select Torx installation tool and hex head drive socket and place the point of fastener through wall guard and into pre-drilled hole. Drive the fastener in one continuous motion until fully seated at the proper embedment. The driver will automatically disengage from the head of the fastener.

E. Install end caps at all openings and corners.

3.4 INSTALLATION – CORNER GUARDS

A. Install in accordance with manufacturer's printed instructions and accepted shop drawings.

B. Install corner and edge guards plumb, square, and free from warp or twist while maintaining dimensional tolerances and alignment with adjacent surfaces.

C. Install where indicated on Drawings.

D. Fasten to wall with specified security fasteners spaced at 3 inches from each end and spaced evenly along the length of the corner guard, not to exceed 24 inches on center.

3.5 CLEANING AND PROTECTION

A. Comply with requirements of Division 01.

B. Clean as recommended by manufacturer. Do not use materials or methods which may damage surface or surrounding construction.

C. Protect work from damage to surface, profile, and shape.

D. Completely remove protective covering from wall protection items prior to final project acceptance.

E. Replace damaged items at no cost to Owner.

END OF SECTION

SECTION 10 28 13

TOILET ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Toilet accessories.

B. Attachment hardware.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 09 22 16 – Non-Structural Metal Framing.

C. Section 09 29 00 – Gypsum Board.

D. Section 09 30 00 – Tiling.

E. Section 09 77 10 – Sanitary Wall and Ceiling Finishes.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
2. ASTM A269 – Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Submit data on accessories describing size, finish, details of function, attachment methods.

C. Manufacturer's Installation Instructions: Submit installation instructions, special procedures, and conditions requiring special attention.

1.5 KEYING

A. Master key all accessories.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for installing work in conformance with Title 24 Accessibility Requirements.

1. Toilet accessories required to be accessible shall be mounted at heights according to CBC Section 11B-603.5.
2. Toilet accessories shall not be located closer than 1-1/2 inches clear of the bottom and ends of the grab bar and 12 inches clear of the top of the grab bar per CBC Section 11B-609.3.
3. Toilet tissue dispensers shall be continuous flow type per CBC Section 11B-604.7.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate the work of this Section with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.8 WARRANTY

A. Manufacturer's standard one year warranty for materials and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Bobrick.

B. Seachrome.

C. American Specialties, Inc.

D. Bradley.

E. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Stainless Steel Sheet: ASTM A167, Type 304.

B. Tubing: ASTM A269, stainless steel.

C. Fasteners, Screws, and Bolts: Hot dip galvanized, tamperproof.

D. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FABRICATION

A. Weld and grind smooth joints of fabricated components.

B. Form exposed surfaces from single sheet of stock, free of joints.

C. Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

D. Back paint components where contact is made with building finishes to prevent electrolysis.

E. Shop assemble components and package complete with anchors and fittings.

F. Provide steel anchor plates, adapters, and anchor components for installation.

G. Hot dip galvanize exposed and painted ferrous metal and fastening devices.

2.4 FACTORY FINISHING

A. Stainless Steel: No. 4 satin luster finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that site conditions are ready to receive work and dimensions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site at appropriate time for building-in.

B. Provide templates and rough-in measurements as required.

C. Verify exact location of accessories for installation.

3.3 INSTALLATION

A. Install fixtures, accessories and items in accordance with manufacturers' instructions.

B. Install all items plumb and level.

C. Secure all items rigidly in place. Anchor to structure with anchors appropriate for use with type of adjacent construction. Fasteners shall securely fasten items to wall construction involved. Fasteners shall provide stiffness and rigidity to keep items square, in accurate position without twisting, buckling or warping. Fasteners to framing substrate shall be the following minimums; greater as required by the toilet accessory manufacturer or as conditions warrant:

1. Metal Framing: #12 corrosion resistant self-drilling, self-tapping screws by length as required to penetrate backing 1/4 inch minimum.
2. Masonry: 1/4 inch diameter corrosion resistant concrete screws with 1-3/4 inches minimum embed.

3.4 SCHEDULE

A. Bobrick Washroom Equipment or other manufacturers’ model numbers indicated on Drawings are listed to establish a quality standard. Refer to Drawings for items required.

END OF SECTION

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire extinguishers.

B. Cabinets.

C. Accessories.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 09 22 16 – Non-Structural Metal Framing: Blocking/backing for attachment.

C. Section 09 29 00 – Gypsum Board.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. California Fire Code (CFC) – Section 906, Portable Fire Extinguishers.
2. California Code of Regulations (CCR), Title 19, Division 1, Chapter 3, Fire Extinguishers.
3. UL 299 – Dry Chemical Fire Extinguishers.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, and locations.

C. Product Data: Provide extinguisher operational features, color and finish, and anchorage details.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.6 REGULATORY REQUIREMENTS

A. Conform to CFC Section 906 and CCR Title 19 for requirements for extinguishers.

B. Location and Operation: Fire extinguishers and fire extinguisher cabinets shall conform to CBC Sections 11B-307, 11B-308, 11B-309, and 11B-403.

1.7 WARRANTIES

A. Fire Extinguishers: Fire extinguishers shall be free from defects in material and workmanship under conditions of normal use for a period of six years from date of shipment.

1. Carbon dioxide and water/water-based fire extinguishers shall be free from defects in material and workmanship under conditions of normal use for a period of five years from date of shipment.

B. Fire Extinguisher Cabinets: Fire extinguisher cabinets shall be free from defects in material and workmanship under conditions of normal use for a period of one year from date of shipment.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers and Products:

1. J.L. Industries, Inc., Bloomington, MN; phone: 800.554.6077; fax: 952.835.2218; URL: www.activarcpg.com/jl-industries. Products:

a. Fire Extinguishers:

1) Kitchen: Saturn 25, Class K.

2) Mechanical and Electrical Rooms: Cosmic Series, Model No. 10E.

3) All Other Locations: Cosmic Series, Model No. 5E.

b. Cabinets:

1) Security:

a) Non-Rated, Semi-Recessed: Security/Detention Model No. SSFC-32 MCP.

b) Non-Rated, Surface Mounted: Security/Detention Model No. SSFC-33 MCP.

c) Fire-Rated: Security/Detention Model No. SSFC-32FX2 MCP.

2) All Other Locations:

a) Non-Rated: Ambassador Series, Model No. 1817W10.

c. Fire Extinguisher Wall Brackets:

1) Kitchen: Model No. MB810C.

2) Mechanical and Electrical Rooms: Model No. MB846C.

3) All other locations: MB818C.

2. Larsen's Manufacturing Co., Minneapolis, MN; phone: 763.571.1181; fax: 763.571.6900; URL: www.larsensmfg.com .
3. Potter-Roemer, Santa Ana, CA; phone: 800.366.3473; fax: 888.404.7960; URL: www.potterroemer.com .

B. Substitutions: Under provisions of Division 01.

2.2 EXTINGUISHERS

A. Class K: Wet chemical type, UL 8, 2-1/2 gallon capacity, stainless steel tank with pressure gauge; minimum 2A:K Rating.

B. Mechanical and Electrical Rooms: Dry Chemical Type, UL 299, ten pound capacity, enameled steel tank, with pressure gauge; minimum 4A-80B:C UL rating.

C. All Other Locations: Dry Chemical Type, UL 299, five pound capacity, enameled steel tank, with pressure gauge; minimum 3A-40B:C Rating.

2.3 CABINETS

A. Door and Trim Construction: 18 gauge cold rolled steel. Cabinet doors shall be flush and have a 5/8 inch door stop. Frame trim shall be 1-3/4 inches wide and door trim shall be 1-1/4 inches wide on doors with glazing.

B. Trim Style and Depth: Semi-recessed with 3 inch rolled edge.

C. Tub: 18 gauge cold rolled steel.

D. Door Glazing: 1/8 inch thick clear acrylic.

E. Hardware: Continuous hinge, zinc-plated handle above Saf-T-Lok, and roller catch. Handle shall be in compliance with CBC Section 11B-309.4 and shall not require more than five pounds force to operate.

F. Mounting Fasteners: Appropriate to cabinet and mounting substrate material.

2.4 SECURITY/DETENTION CABINETS

A. Door and Trim Construction: 14 gauge stainless steel. Cabinet doors shall be flush and have a 5/8 inch door stop.

B. Trim Style and Depth: Semi-recessed with 2-1/2 inch square trim.

C. Tub: 14 gauge stainless steel.

D. Hardware: Heavy-duty continuous hinge and prep for mortise cylinder cam lock specified in Section 11 98 14 – Detention Door Hardware.

E. Mounting Fasteners: Appropriate to cabinet and mounting substrate material.

2.5 FABRICATION

A. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.

B. Pre-drill for anchors.

C. Weld, fill and grind components smooth.

2.6 FINISHES

A. Extinguisher: Manufacturer's standard finish.

B. Steel Cabinets:
   1. Cabinet Exterior Trim and Door: White powder coat paint finish.
      a. Provide vertical black lettering on door stating “FIRE EXTINGUISHER”.
   2. Cabinet Interior: White powder coat paint finish.

C. Stainless Steel Cabinets:
   1. Cabinet Exterior Trim and Door: #4 satin finish.
      a. Provide vertical black lettering on door stating “FIRE EXTINGUISHER”.
   2. Cabinet Interior: #4 satin finish.

D. Wall Bracket: Red baked enamel paint finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify rough openings for cabinets are correctly sized and located.

B. Verify blocking/backing for wall brackets are correctly sized and located.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Mount cabinets and wall brackets such that the fire extinguisher handle is at 48 inches maximum above the finished floor.

C. Install cabinets and wall brackets plumb and level.

D. Secure cabinets and wall brackets rigidly in place. Anchor to structure with anchors appropriate for use with type of adjacent construction. Anchorage shall securely fasten items to wall construction involved. Fasteners shall provide stiffness and rigidity to keep items square, in accurate position without twisting, buckling or warping. Fasteners to framing substrate shall be the following minimums; greater as required by the cabinet/bracket manufacturer or as conditions warrant:
   1. Metal Framing:
      a. Cabinets: Three-#10 self-tapping sheet metal screws each side of cabinet by length as required to penetrate framing or backing member 1/4 inch minimum.
      b. Wall Brackets: Three-#10 self-tapping sheet metal screws each bracket by length as required to penetrate framing or backing member 1/4 inch minimum.
   2. Concrete/Masonry:
      a. Cabinets and Wall Brackets:
         1) Masonry Anchors: 1/4 inch diameter by 2 inch long Torx concrete screws, hex washer head, Perma-Seal coated carbon steel.

2) Install fasteners at 16 inches on centers – offset. Use proper diameter Torx drill bit. Drill hole into the substrate 1/2 inch deeper than the required embedment. Select Torx installation tool and hex head drive socket and place the point of fastener through wall guard and into pre-drilled hole. Drive the fastener in one continuous motion until fully seated at the proper embedment. The driver shall automatically disengage from the head of the fastener.

E. Place extinguishers in cabinets and on wall brackets.

END OF SECTION

SECTION 10 51 13

METAL PERSONNEL LOCKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal personnel locker units with hinged doors.

B. Benches.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 09 22 16 – Non-Structural Metal Framing.

C. Division 26 – Electrical.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM A1008/A1008M – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

1.4 SUBMITTALS

A. Submit under provisions of Division 01

B. Shop Drawings: Include details of layout and installation, as well as clearances, spacing, relation to adjacent construction, elevation, trim pieces, components, assemblies, connections, attachments, reinforcements, and anchorage detail. Furnish floor layouts and technical and installation manuals.

C. Product Data: Submit manufacturer’s product literature, schematics, testing data, and other items for each product described in this Section. Include data substantiating that products to be furnished comply completely with requirements of the contract documents and specifications. Include installed weight, furnished specialties, and accessories.

D. Samples: Three 3-1/4 inch x 1-1/2 inch paint samples of color selected by Architect.

E. Sustainable Design Submittals:

1. Recycled Content.
2. Regional Materials.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum ten years' experience in work of this Section.

B. Installer Qualifications: Minimum two years' experience in work of this Section.

C. Accessibility: Conform to Americans with Disabilities Act - 2010 Standards for Accessible Design and CBC Chapter 11B for accessible locker units.

1.6 WARRANTIES

A. Manufacturer's five year warranty against defects in materials and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design: Tiffin Metal Products Company, Tiffin, OH; 800-537-0983, www.tiffinmetal.com. Products:
   1. Sentinel Personnel Lockers.
      a. Type 1: Single tier.
      b. Type 2: Double tier.
   2. Benches.

B. Spacesaver.

C. Substitutions: Under provisions of Division 01.

2.2 SYSTEM DESCRIPTION

A. Metal Lockers:
   1. Type 1 Locker Size: 18 inches wide x 18 inches deep x 66 inches high.
      a. Base Drawer Unit Size: 18 inches wide x 36 inches deep x 18 inches high.
   2. Type 2 Locker Size: 18 inches wide x 24 inches deep x 84 inches high.

B. Locker Room Benches:
   1. Size: 48 inches long x 24 inches deep x 17-1/2 inches high, with four pedestals per bench.
   2. Benchtop: 1-1/4 inch thick butcher-block maple with two coats of catalyzed lacquer finish.
   3. Pedestals: Model No. 60822H pedestal, Heavy-duty steel tubing uprights welded to top and bottom flanges. Color: Same as locker color.

2.3 MATERIALS

A. Steel Sheet: Conforming to ASTM A1008/A1008M.
   1. Recycled Content: Minimum 30 percent recycled steel, with minimum 30 percent classified as post-consumer.

2.4 FABRICATION, TYPE 1 LOCKER

A. Configuration:
   1. Single tier with drawer unit.

B. Construction:
   1. Doors: Minimum 16 gauge steel.
   2. Back Panels, Top Panels, and Inner Panels, except inner doors: Minimum 20 gauge steel.
   3. Side and Bottom Panels: Minimum 18 gauge steel.

C. Doors:
   1. Louvered top and bottom.
   2. Door Hinges: 14 gauge steel, continuous type, concealed, 180 degree opening.

D. Frames:
   1. Formed and welded into integrated units with doors installed.
   2. Body parts flanged and angled to provide rigidity; assembled by welding, bolting, or riveting using corrosion-resistant bolts and aluminum or stainless steel rivets.
   3. Provide mounting holes for attaching lockers side-by-side.

E. Internal Components:
   1. Shelves:
      a. One small and one large shelf.
      b. One small shelf with valuables compartment.
   2. Double hook for storage.
   3. Single coat hook on each side panel.
   4. Pegboard panels on inside of doors.
   5. Knockouts for electrical conduit; verify location in field.

F. Drawer Unit:
   1. Located under locker unit.
   2. Width to match locker x 36 inches deep x 18 inches high.
   3. 200 pound capacity drawer slides.
   4. Flush mounted handles.
   5. Louvered.
   6. Keyed lock; furnish one key per lock and one master key. Key as directed by Owner.

G. Bench: Mixed hardwood, attached to top of drawer unit at each locker with 36 inch deep drawer.

H. Door Locks and Latches:
   1. Lift latch operated, top and bottom bayonet style.
   2. Recessed door latch, painted cup with integral door latch/pull, pry-resistant, not protruding beyond face of door.
   3. Locks: Combination locks with master key override; furnish two master keys.

I. Number Plates:
   1. Number plates furnished loose and affixed to locker using pop rivets in pre-drilled holes in door.
   2. Number doors as directed by Owner.

J. Accessories:
   1. Continuous sloping tops, minimum 24 gauge steel.
   2. Finished end panels without exposed fasteners.
   3. Filler panels as required to fill all external gaps.

2.5 FABRICATION, TYPE 2 LOCKER

A. Configuration:
   1. Double tier.
   2. Provide accessible lockers where indicated on Drawings.

B. Construction:
   1. Doors: Minimum 16 gauge steel.
   2. Back Panels, Top Panels, and Inner Panels, except inner doors: Minimum 20 gauge steel.
   3. Side and Bottom Panels: Minimum 18 gauge steel.

C. Doors:
   1. Louvered bottom.
   2. Door Hinges: 14 gauge steel, continuous type, concealed, 180 degree opening.

D. Frames:
   1. Formed and welded into integrated units with doors installed.
   2. Body parts flanged and angled to provide rigidity; assembled by welding, bolting, or riveting using corrosion-resistant bolts and aluminum or stainless steel rivets.
   3. Provide mounting holes for attaching lockers side-by-side.

E. Internal Components:
   1. Shelves:
      a. One small and one large shelf.
      b. One small shelf with valuables compartment.
   2. Double hook for storage.
   3. Single coat hook on each side panel.
   4. Pegboard panels on inside of doors.
   5. Knockouts for electrical conduit; verify location in field.

F. Door Locks and Latches:
   1. Lift latch operated, top and bottom bayonet style.
   2. Recessed door latch, painted cup with integral door latch/pull, pry-resistant, not protruding beyond face of door.
   3. Locks: Combination locks with master key override; furnish two master keys.
      a. Accessible Lockers: Latch and locking hardware at accessible lockers shall not require twisting, pinching or grasping, or more than five pounds of force to operate per CBC Section 11B-309.4. Product: NextLock Range Series keypad and RFID lock with vertical body style, pin-connected rear unit and ADA compliant keys for use with vertical locking bars as manufactured by Digilock or accepted equal.

G. Number Plates:

1. Number plates furnished loose and affixed to locker using pop rivets in pre-drilled holes in door.
2. Number doors as directed by Owner.

H. Accessories:

1. Continuous sloping tops, minimum 24 gauge steel.
2. Finished end panels without exposed fasteners.
3. Filler panels as required to fill all external gaps.
4. 4 inch high base, minimum 16 gauge steel.

2.6 MODULAR ELECTRICAL SYSTEM COMPONENTS:

A. Junction Boxes: Provide one for each locker. Box shall be installed in cutout located on locker top or back panel.

B. Receptacles: Provide one duplex receptacle for each locker. Receptacle shall be installed directly into junction box.

1. At double tier lockers, provide internal conduit from lower tier locker as power raceway to duplex outlet in upper tier locker.

C. Double tier lockers shall include a power strip mounted in side panel in lower locker connected to receptacle in upper locker. Power cord shall be concealed in upper locker with a 1 inch wide Panduit LD5WH6-A or equivalent raceway mounted to rear corner edge from top to bottom.

D. Jumper Cables: Cables shall be used to wire multiple lockers together; length as required. Cable shall be installed directly into end of junction box.

E. Power Supply Cables: Cables shall be used for connection to building power supply, length as required. Cable shall be installed directly into end of junction box.

2.7 FINISHES

A. Steel:

1. Minimum 3 mil thick factory-applied baked-on textured powder coat finish.
2. Color: As selected by Architect from manufacturer's full color range.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install lockers and benches in accordance with manufacturer's instructions.

B. Fasten lockers to each other and to walls per manufacturer’s recommendations to meet CBC seismic requirements.

C. Secure lockers and benches with anchor devices to suit substrate materials. Minimum pullout force per anchor: 100 pounds.

D. Install lockers plumb and square.

E. Place and secure on prepared base.

F. Bolt adjoining locker units together to provide rigid installation.

G. Install sloping tops and metal fillers using concealed fasteners. Provide flush hairline joints against adjacent surfaces.

H. Locker Benches: Install locker benches by fastening bench tops to pedestals and securely anchoring to floor using appropriate anchors.

3.2 ADJUSTING

A. Adjust doors, latches, locks, and operating hardware to function properly for smooth operation without binding. Verify that latches are operating satisfactorily.

B. Adjust built-in locks to prevent binding of dial or key and ensure smooth operation.

C. Touch-up with factory-supplied paint and repair or replace damaged products.

3.3 CLEANING

A. Clean work under provisions of Division 01.

B. Clean interior and exterior surfaces in accordance with manufacturer's recommendations.

1. Do not use harsh cleaning products or methods that could damage finish.

3.4 PROTECTION

A. Protect installed products through completion of project.

END OF SECTION

SECTION 10 56 13

METAL STORAGE SHELVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal storage shelving.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 04 22 00 – Concrete Unit Masonry.

C. Section 09 22 16 – Non-Structural Metal Framing.

1.3 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Submit product data for sizes, types, and methods of construction, and attachment details.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Protect metal shelving from damage by other trades. Store in dry protected areas. Replace any damaged items at no cost to Owner.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. InterMetro Industries Corporation. Product: Metro Heavy Duty Solid Shelving.
   1. Shelves:
      a. Model #1836HFG.
      b. Model #1848HFG.
   2. Posts: Model #74HPC.

B. Western Pacific Storage Solutions.

C. Republic Storage Systems, LLC.

D. Tennsco.

E. Quantum Storage Systems.

F. Substitutions: Under provisions of Division 01.

2.2 EQUIPMENT

A. Solid Shelving Units: 16 gauge galvanized flat steel shelves with 1,000 pound load rating. Each shelving unit shall be:

1. 18 inches deep x 36 inches long x 76 inches high.
2. 18 inches deep x 48 inches long x 76 inches high.
3. Refer to Drawings for location of each size.

B. Posts: 1 inch outside diameter steel posts with rolled grooves providing shelf adjustability in 2 inch increments along entire height. Each post shall be 76 inches high. Finish: Chrome.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install shelving per manufacturer's recommendations.

B. Install metal shelving units in locations as designated on the Drawings. Units shall be set plumb and level.

END OF SECTION

SECTION 10 73 16

METAL CANOPIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Extruded aluminum hanger rod canopies.

B. Extruded aluminum hanger rod sun control louver canopies.

C. Extruded aluminum cantilever sun control louver canopies.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 05 40 00 – Cold-Formed Metal Framing.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. AA – Designation System for Aluminum Finishes.
2. ASTM B221/B221M – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

1.4 PERFORMANCE REQUIREMENTS

A. General: Design, fabricate, and install awnings to withstand loads from gravity, wind, ponding, drift, seismic, thermal, structural movement, and exposure to weather.

B. Structural Performance: Provide canopies capable of withstanding effects of gravity loads and wind loads. Determine wind load based on uniform pressure indicated on Drawings. Seismic performance shall be in accordance with CBC requirements.

C. Thermal Movement: Prevent buckling, opening of joints, overstressing of components, failure of connections, and tearing of fabric due to thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Range: 120 degrees F, ambient, 180 degrees F material surface.

1.5 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data: Submit manufacturer's descriptive literature and product specification for each material used in canopy assemblies.

C. Calculations: Submit engineering calculations stamped and signed by a structural engineer licensed in California.

D. Shop Drawings: Show layout, locations, and extent of canopies, methods of attachment, structural component locations/positions, material dimensions, and complete details of construction and assembly.

E. Manufacturer's installation instructions.

1.6 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section with a minimum five years documented experience.
2. Supplier Qualifications: The manufacturer or its subsidiary or licensed agent approved to supply products of this Section and honor any claims against the product presented in accordance with the warranty.
3. Installer Qualifications: Firm specializing in installing work specified in this Section acceptable to manufacturer with documented experience on at least five projects of similar nature in past three years.

B. Pre-Installation Meetings

1. Conduct pre-installation meeting in accordance with provisions of Division 01.
2. Convene pre-installation meeting one week prior to commencing work of this Section.
3. Coordinate work in this Section with work in related Sections.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Store materials in a dry secure place. Protect from weather, surface contaminants, corrosion, construction traffic, and other potential damage.

1.8 MAINTENANCE

A. Maintenance Data

1. Comply with requirements of Division 01.
2. Include maintenance and cleaning information.

1.9 WARRANTY

A. Comply with provisions of Division 01.

B. Warranty: Manufacturer's standard form in which manufacturer and fabricator agree to repair or replace components of canopies that fail in materials or workmanship within specified warranty period.

C. In the event a warranted product or component fails, replace failed product or component under the provisions of Division 01, at no cost to Owner.

PART 2 PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Acceptable Manufacturers:

1. Basis-of-Design: Mapes Architectural Canopies, Inc., Lincoln, NE; 888-273-1132, www.mapes.com. Products:
   a. Super Lumideck hanger rod canopies.
   b. SuperShade cantilever sun control louver canopies.
2. Eide Industries Inc.; Cerritos, CA; 800-422-6827, www.tensionstructures.com.
3. Austin Mohawk Inc., Utica, NY; 800-211-6534, www.austinmohawk.com.

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Decking, beams, posts, and fascia shall be ASTM B221 extruded aluminum, alloy 6063-T6.

2.3 HANGER ROD CANOPIES

A. Components:

1. Corrugated Decking: 2-3/4 inch deep x 6 inch wide x 0.078 thickness interlocking extruded 6063-T6 aluminum.
2. Fascia: 8 inch deep “J” style, 0.125 extruded 6063-T6 aluminum.
3. Support Beams: 3.31 inch x 3.31 inch x 0.25 inch extruded aluminum “I” beams.
4. Hanger Rods and Hardware: 1 inch diameter schedule 40 steel pipe; 1/4 inch thick steel angles and plates; drop-forged 5/8 inch steel clevis; 5/8 inch x 6 inch steel threaded rods; steel bolts, nuts, and washers as standard with manufacturer.
5. Wall Fasteners:
   a. 1/2 inch diameter steel thru eyebolts with steel washers, nuts and backing plates.
   b. 1/2 inch diameter steel thru threaded rods with steel washers, nuts, and 3 inch diameter x 0.25 inch backing plates.
   c. Escutcheon Plates: 7 inch by 7 inch extruded aluminum.
6. Drainage: Concealed integral gutters and fascia drains with 0.032 aluminum scuppers.
7. Finishes:
   a. Aluminum: Class I Clear anodized.
   b. Steel: Two coat Kynar paint system, color to match clear anodized aluminum.

2.4 HANGER ROD SUN CONTROL LOUVER CANOPIES

A. Components:

1. Louver Blades: 0.110 inch extruded 6063-T6 aluminum “Z” louver blades..
2. Fascia: 8 inch deep “J” style, 0.125 extruded 6063-T6 aluminum.

3. Support Beams: 3.31 inch x 3.31 inch x 0.25 inch extruded aluminum “I” beams.
4. Extruded aluminum front clip angles.
5. Extruded aluminum rear clip angles.
6. Hanger Rods and Hardware: 1 inch diameter schedule 40 steel pipe; 1/4 inch thick steel angles and plates; drop-forged 5/8 inch steel clevis; 5/8 inch x 6 inch steel threaded rods; steel bolts, nuts, and washers as standard with manufacturer.
7. Wall Fasteners:
   a. 1/2 inch diameter steel thru eyebolts with steel washers, nuts and backing plates.
   b. 1/2 inch diameter thru threaded rod with washers, nuts, and 1/4 inch thick backing plate.
   c. Escutcheon Plates: 7 inch by 7 inch extruded aluminum.
8. Finishes:
   a. Aluminum: Class I Clear anodized.
   b. Steel: Two coat Kynar paint system, color to match clear anodized aluminum.

2.5 CANTILEVER SUN CONTROL LOUVER CANOPIES

A. Components:
1. Louver Blades: 0.110 inch extruded 6063-T6 aluminum “Z” louver blades.
2. Fascia shall be 8 inch “J” style 0.125 inch extruded 6063-T6 aluminum.
3. Hanger Tubes: 3 inch x 3 inch x 1/4 inch thick steel hanger tube welded to 8 inch x 7 inch x 1/2 inch thick steel plate.
4. Extruded aluminum front clip angles.
5. Extruded aluminum rear clip angles.
   a. Size: 2 inches x 2 inches x 0.1875 inch thickness x 8 inches long.
6. Wall Fasteners:
   a. 1/2 inch diameter steel thru threaded rods with steel washers, nuts, and 3 inch diameter x 0.25 inch backing plates.
7. Cantilever supported brackets shall be standard finish.
8. Finishes:
   a. Aluminum: Class I clear anodized.
   b. Steel: Two coat Kynar paint system, color to match clear anodized aluminum.

2.6 ACCESSORIES

A. Anchors, Fasteners, Fittings, Hardware, and Installation Accessories: Complying with performance requirements indicated and suitable for exposure conditions, supporting structure, anchoring substrates, and installation methods indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate conditions and dimensions. Verify if substrate is ready and acceptable to receive canopies.

B. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 INSTALLATION

A. Install in accordance with manufacturer's printed instructions and approved shop drawings.

B. Install canopies plumb, level, and square, and free from warp or twist while maintaining dimensional tolerances and alignment with adjacent surfaces.

C. Install canopies at locations and in position indicated, securely connected to supporting structure, free of rack, and in proper relation to adjacent construction.

3.3 CLEANING AND PROTECTION

A. Clean exposed surfaces, including metal and using non-abrasive materials and methods as recommended by manufacturer.

B. Do not use materials or methods, which may damage finish or surrounding construction.

C. Remove and replace damaged canopies which cannot be satisfactorily repaired, at no cost to Owner.

END OF SECTION

SECTION 10 75 00

FLAGPOLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum flagpoles, ground-mounted.

B. Halyards and accessories.

C. Flags.

D. Concrete foundation.

1.1 PRODUCTS FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

E. Furnish anchor devices and foundation tube sleeve to Section 03 11 00, Concrete Forming, for placement.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete; for concrete foundation.

B. Division 26 Sections for grounding, lighting fixture, and related work.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. American Architectural Manufacturers Association; AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
2. American Association of State Highway and Transportation Officials; AASHTO M-36 – Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewer and Drains.
3. ASTM B241/B241M – Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
4. ASTM C33 - Standard Specification for Concrete Aggregates.
5. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
6. ASTM D1187 - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
7. National Association of Architectural Metal Manufacturers (NAAMM) - Metal Finishes Manual for Architectural and Metal Products.

8. NAAMM FP 1001 - Guide Specifications for Design of Metal Flagpoles.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Indicate on shop drawings, detail dimensions, base attachment details, anchor requirements and imposed loads.

C. Provide product data on pole, accessories and configurations.

D. When requested by Architect or Owner, submit one 3-inch cutaway sample of flagpole tube with specified finish. Submit samples under provisions of Division 01.

E. Submit manufacturer's installation instructions under provisions of Division 01.

1.5 SYSTEM DESCRIPTION

A. Pole with Flags: Designed for 110 mph wind speed, without permanent deformation, non-resonant, design safety factor of 2.5, equipped with two four-foot by six-foot flags; meeting applicable requirements of NAAMM FP 1001.

B. Type: One piece, ground set; fixed type.

C. Pole Design: Tapered top end.

D. Nominal Height: 30 feet, measured from ground.

E. Halyard: Internal type.

F. Foundation: Cast-in-place concrete, as indicated on Drawings; and in accordance with manufacturer’s recommendations.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Store and protect products under provisions of Division 01.

C. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.

D. Protect flagpole and accessories on site from damage or moisture.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Flagpoles:

1. L.Ph. Bolander & Sons, San Francisco, CA; 800-434-5611, www.bolanderflagpole.com. Product: Catalog #HTJ30, one-piece, 30-foot exposed height flagpole.
2. Baartol Company, Kenton, OH; 800-558-6044, www.baartol.com.
3. American Flagpole, Abingdon, VA; 800-368-7171, www.americanflagpole.com.

B. Flags:

1. The Flag Company, Inc., Acworth, GA; 800-962-0956, www.flagco.com.
2. Annin Flagmakers, Roseland, NJ; 973-228-9400, www.annin.com.
3. The Flag Zone, Gilbertsville, PA; 800-976-4201, www.theflagzone.com.

C. Substitutions: Under provisions of Division 01.

2.2 POLE MATERIALS

A. Aluminum Tube: ASTM B241; 6063 alloy, T6 tempered.

2.3 POLE FABRICATION

A. All flagpoles shall be of one-piece construction.

B. Outside Butt Diameter: 6 inches.

C. Outside Top Diameter: 3-1/2 inches.

D. Nominal Wall Thickness: 0.188 inch.

2.4 FLAGPOLE COMPONENTS

A. Internal Halyard and Truck Assembly: Provide pole with an internal halyard system including a manually operated cam cleat, a halyard of 5/16-inch diameter, braided, UV-resistant polypropylene rope, and a concealed revolving truck assembly. Halyard and cam cleat shall be serviced through a flush hinged access door with a continuously reinforced periphery.

1. Provide a hinged access door assembly. Door shall hinge on a heavy-duty piano hinge and shall be secured with a cylinder lock.
2. Interior Platform: Provide 24-inch or longer round, solid piece of flexible plastic foam to serve as a platform inside the flagpole tube. Foam shall be adhesively attached to tube wall at two feet below the door opening.
3. The halyard device shall permit a flag to be raised, lowered and flown from any position on the pole without entanglement or slippage.
4. The flag attachment arrangement shall consist of a beaded cable sling encircling the pole and a counterweight to assure descent of flags in all weather conditions. Provide with stainless steel snap hooks.
    a. Provide additional stainless steel snap hooks as required for attachment of second flag.

B. Flags:

1. Material: Polyester, 100 percent, two-ply, spun, woven fabric.
    a. Flag of the United States of America: Embroidered stars, sewn stripes, double-stitched; heavy-duty, non-shrink canvas header; and brass grommets.
    b. Flag of the State of California: Printed graphics; heavy-duty, non-shrink canvas header; and brass grommets.
2. Quantity and Size: Provide two flags as follows, unless otherwise indicated on Drawings.
    a. One four-foot by six-foot flag of the United States of America, and one four-foot by six-foot flag of the State of California.

C. Finial Ball: Flush-seam ball, spun aluminum, 0.0641-inch wall thickness, minimum; 6 inches diameter.

D. Finial Ball with Integral Light Fixture:

1. Manufacturer and Product: The Flagpole Beacon External Commercial Heavy Duty Beacon as manufactured by The Flag Company, Inc. or accepted equal, with the following characteristics:

a. Light Fixture: Two high intensity LED bulbs.

b. Voltage: 120 volts.

c. Finish Color: Gold.

d. External revolving truck to follow flag position.

e. Wire kit ten feet past height of pole.

2.5 MOUNTING COMPONENTS

A. Foundation Tube: AASHTO M-36, corrugated tube, 16 gauge (uncoated metal thickness 0.060-inch, minimum) steel, galvanized, with 3/8-inch thick welded plates for setting; tube depth as indicated.

B. Lightning Protection: Grounding rod (spike), 3/4-inch diameter, welded to foundation tube assembly.

C. Pole Base Attachment: Flush; aluminum base with cover.

2.6 ACCESSORIES

A. Non-shrink, Non-metallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107.

B. Sand: ASTM C33, fine aggregate.

C. Elastomeric Joint Sealant: Single-component non-sag urethane or single-component neutral-curing silicone joint sealant complying with requirements in Section 07 92 00 for “Use NT (non-traffic)” and for “Use M, G, A,” and, as applicable to joint substrates indicated, for “Use O.”

1. Sealants shall comply with regulations of South Coast Air Quality Management District Rule 1168 for VOCs.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

2.7 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Protection of Dissimilar Surfaces: Coat dissimilar metals and metal surfaces in contact with concrete with bituminous paint.

B. Aluminum Surfaces Except Finial: Architectural Class I finish per Aluminum Association Standard AA-M10C22 A41, clear anodized (Class I, 0.018 mm or thicker coating); complying with AAMA 611.

C. Finial Ball: Gold anodized finish; AAMA 611, AA-M32C22A43 (Class I, 0.018 mm or thicker); gold color.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

B. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with a heavy coat of bituminous paint.

B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.

C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.

D. Place concrete, as specified in Section 03 30 00. Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than seven days. Non-staining curing compound may be used for curing.

3.3 INSTALLATION

A. Install flagpole, base assembly and fittings in accordance with manufacturer's printed instructions.

1. Verify and ensure that plastic foam platform inside the flagpole tube is firmly attached to tube wall.

B. Install welded base assembly for flagpoles in concrete and fasten in place.

C. Ground Setting:

1. Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure. Install flagpole, plumb, in foundation tube.

2. Place flagpole on bottom plate between steel centering wedges and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of non-shrink grout, and joint sealant, and cover with flashing collar. Seal space between flagpole and collar with joint sealant.

D. Electrically ground flagpole installation.

E. Install flags and check flagpole assembly for smooth operation in presence of Owner’s Representative.

3.4 TOLERANCES

A. Maximum Variation from Plumb: 1 inch.

3.5 ADJUSTING AND CLEANING

A. Clean surfaces as recommended by flagpole manufacturer.

B. Adjust operating devices so that halyard functions smoothly.

END OF SECTION

SECTION 10 90 00

MISCELLANEOUS SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Miscellaneous specialty items.

B. Accessory anchors, bolts, screws, and braces.

1.2 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings:

1. Indicate fabrication, materials, installation details, finishes, and any other required anchoring, fastenings, and hardware.
2. Submit drawing layout for product configuration, support attachment and anchorage details.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Store in manufacturer's original unopened containers and packaging. Protect and handle products to prevent damage to products or finishes.

PART 2 PRODUCTS

2.1 LOBBY SEATING

A. Armless Lounge Chair: Norix Group, Inc. Model No. VA630 Vesta Lounge Armless Chair with upholstered cushioning.

1. Construction: One-piece, rotationally-molded lightly textured polyethylene with the following properties:
   a. Anti-ligature design with no openings.
   b. Tamper-resistant steel-encased nylon glides.
   c. Molded-in access port with threaded screw cap for ballast weighting capability.
   d. Factory installed bolt-down kit.
   e. Factory ballasting: 50 lbs.
2. Size:
   a. Seat Height: 18.2 inches.
   b. Seat Width: 27 inches.
   c. Overall Height: 33 inches.
   d. Overall Depth: 31.3 inches.
   e. Width: 27 inches.

3. Chair shall be chemically resistant to acetone, alcohol, blood, vinegar, urine, feces, salt solution, and chlorine solution.
4. Greenguard Gold certified.
5. Static Load: Tested to 750 lbs.
6. Impact resistance: Dynamic drop tested to a relative impact force of two times BIFMA 5.4 15.4.2 (250 lbs. from 18 inches).
7. Flammability: Meets State of California Technical Bulletin No. 117 upholstered 133, Flammability Test Procedure for Seating Furniture for use in Public Occupancies.
8. Upholstered Cushioning:
   a. Substrate: Plywood.
   b. Cushion Material: polyurethane foam.
   c. Upholstery Fabric: [As selected by Architect from Manufacturer's standard fabrics] [Custom fabric as selected by Architect].
9. Color: As selected by Architect.

2.2 TV MOUNTING BRACKETS

A. Type 1: Model LC4X4WT Security Wall Mount TV Bracket as manufactured by Lucasey.
   1. Accommodates flat screen monitors from 20 inches to 65 inches.
   2. Weight Capacity: 100 pounds maximum.
   3. Tilt: 12 degrees, maximum.
   4. Color: Black.

B. Type 2: Model MD2298 TV Wall Mount Bracket as manufactured by Mounting Dream.
   1. VESA: Equal to or greater than 200 mm s 100 mm and equal to or less than 600 mm x 400 mm.
   2. Weight Capacity: 132 pounds maximum.
   3. Tilt: +5 degrees, -15 degrees.
   4. Swivel: +45 degrees, -45 degrees.
   5. Color: Black.

C. Type 3: Model MI-442 Counterbalance Full Motion LCD Wall Mount as manufactured Mount-it!.
   1. Accommodates flat screen monitors up to 47 inches.
   2. Weight Capacity: 44 pounds maximum.
   3. Color: Black.

2.3 SPECIMEN TURNTABLE PASS BOX

A. Model No. 0515 specimen turntable pass box as manufactured by American Specialties, Inc. or accepted equal, with the following characteristics:
   1. Box shall receive objects up to 5-7/8 inches wide x 10-7/16 inches high x 10 inches deep and shall rotate 360 degrees between catch stops in either direction. Turntable shall be a fully enclosed compartment with only its 6 inch x 10-1/2 inch pass door open and shall be track mounted with ball bearing rotation mechanism at top and bottom. Turntable

retaining door shall be hung on side with a 3/16 inch diameter stainless steel multi-staked piano hinge and shall be held closed with a tumbler lock. Frame shall be 18 gauge and trim shall be 22 gauge. Unit shall be fabricated of alloy 18-8 stainless steel, Type 304, and all exposed surfaces shall have No. 4 satin finish. Unit shall be protected during shipment with a PVC film easily removable after installation. Trim shall adjust for wall thickness of 3-3/8 inches minimum to 7 inches maximum and shall be of one-piece construction with no miters or welding, 1 inch wide and returning 1/4 inch to finished wall.

2.4 SPRINKLER PIPE SOFFIT SYSTEM

A. Enforcer Security Soffit L-Shield fire sprinkler pipe interlock concealment interior soffit system as manufactured by JG Innovations, Inc. or accepted equal, with the following characteristics:

1. The soffit/cover shall be smooth in appearance and shall be fabricated of 16 gauge A60/G90 galvannealed steel with a factory prime paint finish. The cover shall have a snap-lock interfacing with the clips such that once assembled, is rendered virtually irremovable with the use of ordinary tools.
2. Cover joints shall be interlocking integral joints with provision for securement utilizing stainless steel rivets. Rivet spacing shall be at no greater than 2 inch intervals along the joint and positioned at a distance no greater than 1 inch from the end of the overlapping section. External couplings will not be allowed.
3. Provide spring steel shield clips of the size recommended by manufacturer, for securement of the cover. Clips shall be produced from 21 gauge minimum zinc-plated spring steel and shall have a reverse curvature design such that the clips soundly secure the soffit from easy removal. Each clip shall be able to resist a force of 200 pounds uplift at the free end.
4. The soffit/cover shall be sized in accordance with requirements to accommodate the specific application size as indicated on the Drawings.

2.5 AREA OF REFUGE CALL BOX

A. Model No. 2100-956SRM surface mount Area of Refuge call box as manufactured by Rath Area of Refuge or accepted equal, with the following characteristics:

1. Emergency communication shall comply with Americans with Disabilities Act and CBC Chapter 11B accessibility requirements. The phone shall have the ability to be programmed with up to five emergency phone numbers. Upon activation of the emergency mushroom-shaped one-push to talk button, a call will be automatically placed to the Campus Police Station. If no one answers at the Police Station, the call will be automatically redirected to the local Sherriff's Department. Once a call has been made (button pushed), the call can be terminated only by the called party. If the system is not attended 24 hours a day, the call box shall dial a secondary location outside the building to activate two way off-site person to person voice communications.
2. Call box shall have a stainless steel face and hands-free, vandal-resistant speakerphone with a red LED to indicate status of call. The LED shall light up upon push of the button. The light shall be a solid color when the call box is activated, and flash when the call has been received.

3. Call box shall allow the programming in of a specific location message to allow rescue personnel to determine the location of the activated call box. Call box shall have an 18 second minimum recordable message capability, programmable to play one or two times. Call box shall be capable of allowing the called party to replay the location message if necessary to ensure an understanding of the caller location.
4. Call box shall be mounted no higher than 48 inches above finished floor.
5. Call box shall have a faceplate with identification text and corresponding Contracted Grade 2 Braille. Identification shall include “HELP PHONE” and International Phone Symbol.
6. Call box shall have a battery back-up capable of providing up to four hours of electrical back-up in the event of building power failure.
7. Call box shall have the capability of being programmed and reprogrammed both on-site and remotely.

2.6 AUTOMATED EXTERNAL DEFIBRILLATORS (AED)

A. Defibrillator Cabinet: Premium semi-recessed heavy gauge steel cabinet with self-contained audible and flashing light alarms, Item No. PFE7023D as manufactured by Philips or accepted equal, with the following characteristics and accessories:
   1. Cabinet locations as indicated on Drawings.
   2. Cabinet Inside Dimensions: 14 inches wide x 22 inches high x 6 inches deep.
   3. HeartStart FRx Defibrillator Ready-Pack configuration including defibrillator, battery, carry case, SMART Pads II (one pre-connected set and one spare set), setup and maintenance guides, owner’s manual, quick reference guide, and date sticker. Provide one Ready-Pack for each cabinet.
   4. Provide one spare battery and one spare set of defibrillator pads for each AED.
   5. AED Wall Signs: 9 inches high x 6.1 inches deep, T-mount above cabinet, red in color.

PART 3 EXECUTION

3.1 INSTALLATION

A. All products in this Section shall be installed according to manufacturer's instructions and as detailed on Drawings.

B. Area of Refuge Call Box: After initial installation of the emergency call system, provide start-up and testing of the system to ensure complete and proper operation. Provide Owner’s personnel with training on all aspects of system operation.

3.2 ADJUST AND CLEAN

A. Clean and Touch-up: Remove all packing and protection blemishes and thoroughly clean and polish all finish surfaces. Restore any marred or abraded surfaces to their original condition by touching up in accordance with the manufacturer's recommendations. Touch-up shall not be obvious.

B. Defective work: Remove and replace all defective work which cannot be properly repaired, cleaned or touched up, as directed by Architect, with no additional cost to the Owner.

C. Protect installed work during the construction period to prevent abuse and damage.

END OF SECTION

SECTION 11 10 00

LAUNDRY EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Contractor to furnish all labor, materials, and services necessary for the installation of laundry service and related equipment in strict accordance with the contract documents, including that which is reasonably inferred and the following:

1. Provide stands and supports for all equipment requiring them.

2. Locate wall reinforcement or backing, to be provided by the G.C.

3. Cut holes in equipment for pipes, drains, electric outlets, etc., as required for installation. This also includes welded sleeves, collars, ferrules, or escutcheons.

4. Repair any damage as a result of this installation.

5. Remove all debris resulting from this installation.

6. Clean and prepare equipment for operation.

1.2 RELATED WORK: (Performed Under Other Sections of the Specification)

A. General: Utility rough-in; utility lines and final connections between rough-in and equipment; installation of mechanical and electrical fittings and devices in utility lines; and inter-connecting field wiring and piping between components furnished here under.

B. Electrical: Circuit breaker panels; final disconnect (isolating means) fans; electrical receptacles in building structure; contactors; and all conduit in structure required for electrical or mechanical lines for Laundry Equipment.

C. Mechanical:

1. Plumbing: Floor drains; floor sinks and floor troughs; drain lines from equipment to floor drains and floor sinks, unless otherwise specified; P-traps; shut-off valves as required.

2. Ventilation: Ductwork upstream from connection position of equipment.

D. Miscellaneous:

1. Wall reinforcing or backing required for wall-mounted equipment.

1.3 QUALITY ASSURANCE

A. All equipment and accessories shall be the product of a manufacturer regularly engaged in its manufacture.

B. Provide all equipment and accessories new and free from defects.

C. Provide all equipment and accessories in compliance with the applicable National, State, and Local codes

D. Scheduled equipment performance shall be minimum capacity required.

E. Scheduled electrical capacity shall be considered as maximum available.

1.4 REFERENCE STANDARDS

A. All work and materials shall comply with all State and Federal laws, municipal ordinances, regulations and directions of inspectors having jurisdiction.

B. Work and materials shall be in full accord with the latest rules of U.S. Public Health Service, National Board of Fire Underwriters, O.S.H.A., locals or state ordinances, State Fire Marshal, and with prevailing rules and regulations.

C. Electric equipment shall conform to the latest standards of National Electrical Manufacturer's Code U.L. or approved by E.T.L. and local standards.

D. Gas heated equipment shall be equipped with automatic lighters and automatic safety pilots, to conform to A.G.A. standards and carry the A.G.A. seal.

1.5 PRE-INSTALLATION CONDITIONS

A. Permits and Certificates:

1. The Contractor shall obtain and pay for all necessary permits; certificates and licenses required for the performance of his work and shall post all notices required by law.

B. Access for Equipment

1. The Contractor shall verify conditions at the building, particularly door openings and passages, to assure access for all equipment. Any pieces too bulky for existing facilities shall be hoisted or otherwise handled with apparatus as required. All special handling equipment charges shall be paid by the Contractor and coordinated with the General Contractor.

1.6 REQUIRED SUBMITTALS

A. Product data:

1. Equipment Brochure:

a. Initial Submittal: Submit three (3) complete neatly bound brochures of manufacturer's specifications and other pertinent data on commercial catalog items. Partial submittals, unless waived for rough-in scheduling purposes, will not be acceptable.

b. Form: Print item number clearly in upper right-hand corner of each sheet; show manufacturer's name; model number; options, alternates, or attachments; electrical and mechanical data; and all valves, regulators, controls, and devices provided. If no printed data exists, submit required information on manufacturer's drawings of form described below for Shop Drawings; insert reference sheet in brochure in number sequence referring to item number, manufacturer, and drawing number. Include Contractors name and address; project name and submittal data on brochure cover.

c. Final Submittal: Upon receipt of one (1) approved brochure, submit six (6) exact duplicates.

B. Provide in accordance with the requirements of Section 01340. Recommendation is to submit one (1) reproducible and one (1) bond print for review, after which, Contractor will receive the reproducible for printing and distribution.

1. Shop Drawings:

a. Floor Plans: Submit as part of brochure submittal. No less than 1/4 inch to 1-foot scale. Include itemized layouts, equipment schedules, and rough-in plans.

b. Rough-in Plans: Include all mechanical and electrical equipment requirements, including General Contractor and Purveyor furnished equipment, unless otherwise specified. Identify all connection points, and identify and dimension all rough-in points with both vertical (above finished floor), and horizontal dimensions from column centerline or exterior walls. Detail and dimension all structural recesses and depressions required for equipment provided.

c. Shop Details: After receipt of approved plans, submit detailed drawings of all custom fabricated equipment. Scale: not less than 3/4 inch to 1-foot, larger where required for clarity. Show plans, elevations, sections and details of equipment as required to indicate arrangements, construction, and connection with other work; kinds, types, grades thickness' and finishes of materials; reinforcements, joints, bracing, supports, and anchorage; and method of installation.

d. Backing Drawings: In conjunction with shop details, submit separate drawings locating architectural backing required to support all equipment. Dimension in plan, elevation, and (where required) in section. Show maximum load factors for each item requiring wall, ceiling, or special floor support.

2. Operation and Maintenance Data:

a. Service Agencies: After award of a contract, submit a list of names and addresses of all service agencies to be used on the project. All agencies shall be approved by the Owner and shall be within a 50-mile radius of the project.

b. Nameplates: Provide permanently affixed, corrosions resistant nameplate, proportionate to size of fixture, bearing manufacturer's name, model and serial numbers, ratings and characteristics for servicing and maintenance, where applicable, on each item of equipment.

c. Operation and Maintenance Manuals: After substantial completion of project furnish three (3) manuals for each applicable item of equipment provided, as follows: Bind all manuals into a single book with appropriate tabs for each Item Number; a copy of the Inventory List, less prices; and a cover sheet indicating the names, addresses, and telephone numbers of the Architect, if applicable the Designer, the General Contractor and Laundry Service Contractor.

1.7 GUARANTEES, WARRANTIES

A. All work shall be guaranteed against defects for one (1) year from the date of operation of the equipment. Guarantee shall cover replacement at the contractor's expense of every particular of defective material, including transportation and labor, but shall exclude replacement cost of any damaged parts of work caused by carelessness or misuse of the equipment. The Owner may have the defects corrected if the Contractor, after proper notice, fails to proceed promptly to comply with the terms of this guarantee, and the Contractor and his Surety shall be liable for all expenses incurred thereby.

B. Provide one year defective parts and workmanship warranty and 90 days unconditional parts and labor.

C. Provide two year service contract on all laundry equipment; renewable after two years.

D. Equipment bid must be standard production items and must have been in continuous operation in a minimum of five (5) commercial laundry establishments in the contiguous United States within the last 18 months immediately preceding the bid date.

E. A factory approved inventory of spare parts and an actual factory trained resident service technician must be available within a 100 mile radius of the installation site location. The parts and service facilities of the equipment vendor must have been in continuous operation within the above stated 100 mile radius for a minimum of 18 months immediately prior to the date of this bid. Service and parts must be made available to the laundry site within 48 hours of vendor notification.

1.8 ACCEPTABLE MANUFACTURERS

A. Wherever the term " Alternate" or "equal" follows the description of an item of commercial factory-manufacturer it shall mean that the manufacturers listed as alternates are approved for methods of manufacture only and not for their catalogued items without modification, if required. The prime specified model shall govern in matters of capacity, fuel consumption, loading per phase, overall dimensions, materials, functions, and accessories. In all cases, categories of equipment of substantial quantity shall be of the same brand insofar as possible to limit the responsibility of Guarantee and Warranty. Contractor to note alternates in the Bid.

1.9 SUBSTITUTIONS

A. Equipment shall be as specified by specific manufacturer, model number, size, utilities requirement, capacity, as well as options and accessories.

B. Wherever the term “Alternate” follows the description of an item of commercial factory-manufacture it shall mean that the manufacturers listed as alternates are approved for methods of manufacture only and not for their catalogued items without modification. The prime specified model shall govern in matters of capacity, fuel consumption, voltage and phase, overall dimensions, materials, function, and accessories. In all cases, categories of equipment of substantial quantity shall be of the same brand insofar as to limit the responsibility of Guarantee and Warranty.

C. Contractor may present alternate equipment other than those specified as prime or acceptable alternate. Contractor shall clearly and separately state prior to bid opening that he is offering a substitution. He shall submit complete illustrations, specifications, capacities, and utilities, as well as operational data. It is Contractor’s responsibility to prove that the item or items substituted are equal to the specified items. Items of standard equipment shall be the latest model, new at time of delivery.

D. Contractor shall be responsible for all costs associated with the acceptable alternate or approved alternate items, if the item requires additional space or specific utilities that differ from specifications or drawings. Contractor shall be responsible for any retrofitting such as building changes, utility changes and engineering changes. All substitutions must be approved prior to the bid date.

1.10 START-UP AND DEMONSTRATION

A. Contractor shall is put into operation for start-up, demonstration and draining.

B. Return within two (2) weeks after opening to further instruct employees and check equipment.

C. Lubricate and put into proper operation all equipment.

D. Instruct the Owner's employees in the proper use and maintenance of all Items in this Contract.

PART 2 - PRODUCTS

2.1 MANUFACTURED EQUIPMENT:

A. General: Equipment so identified refers to any Item bearing a manufacturer's name and/or model number. Such standard materials, components, and features normally furnished for that model, whether noted or not, are inherent in the specification.

B. Utility Requirements: Any major deviation from the utility requirements shown or specified, resulting either from change of model or manufacturer, or from submitted alternates, shall be clearly indicated on the Contractor's submittals. Any additional costs incurred, as a result of Contractor's failure to do so shall be borne by the Contractor.

2.2 FABRICATION, MILLWORK/CASEWORK

A. Laminated plastic shall be Formica, Parkwood, LaminArt, or approved equal.

1. Laminate to be veneered with approved waterproof and heat-proof cement. Rubber base adhesives are not acceptable.
2. Apply laminate directly over close-grained furniture grade 3/4" plywood with blocking as required, smooth sanded stock to ensure a smooth ripple-free laminated surface.
3. All wood products to be of high quality furniture grade.
4. All exposed faces (exterior & interior) and edges to be faced with 1/16" laminate (1.6 mm) thick material color as selected by Architect. Corresponding backs are to be covered with approved backing and balancing sheet material (white melamine).

2.3 MISCELLANEOUS COMPONENTS STEEL

A. Doors and drawers shall be fabricated as detailed on Contract Documents with heavy duty, solid and hardware as follows:

1. Built-in recessed door and drawer pulls.
2. Cylinder type looking devices, keyed and master keyed, suitable in size and function, for each application. Identify each locking device with manufacturers name and model No. so parts can be easily replaced.
3. Drawer slides to be full extension heavy duty suitable in size and function for each application. Minimum capacity of 125 lb.
4. Submit samples of all hardware during submittal phase, for review and approval.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION OF EQUIPMENT:

A. Supervision: A competent superintendent, representing the Contractor shall be present during progress of the work.

3.2 CUTTING AND FITTING:

A. Cutting and fitting required on the equipment by subcontractors to make their work fit.

B. Charges and all anticipated repairs shall be noted in writing before work is performed. In case this Contractor does not follow this procedure, the expense shall be borne by him.

C. No cutting, notching, drilling, or altering of any kind shall be done to the building without first obtaining permission.

3.3 PROTECTION OF EQUIPMENT

A. Be responsible during the progress of the project to protect equipment against theft and/or damage until final acceptance by the Owner.

3.4 ITEMIZED LIST OF EQUIPMENT

ITEM 1: LAUNDRY CARTS
Provided by Owner, Not in LEC Contract

ITEM 2: RECESSED EYE WASH
Manufacturer: Guardian
Model: GBF1735DP/G3600LF
Furnish and set-in-place in accordance with Part-2 Products, Plans and Details.

ITEM 3: SOAK SINK
Manufacturer: E.L. Mustee
Model: 27F
Furnish and set-in-place in accordance with Part-2 Products, Plans and Details.

ITEM 4: FLOOR TROUGH
Manufacturer: H-M COMPANY
Model: In Ground 18x135
Furnish and set-in-place in accordance with Part-2 Products, Plans and Details.
1. Correctional package

ITEM 5: 105 LB WASHER/EXTRACTOR
Manufacturer: Unimac
Model: UWT105N2
Alternate: Milnor
Furnish and set-in-place in accordance with Part-2 Products, Plans and Details.
1. Microprocessor control with 30 field programmable formulas and two (2) pre-set formulas.
2. Anti-vibration suspension.
3. High-speed extract
4. Vacuum breakers.
5. Heavy-duty steel frame.
6. Automatic supply injection.
7. Stainless steel cylinder.
8. 105lb, min 15.9 cubic feet cylinder capacity

9. Safety interlock.
10. Heavy-duty 5 hp motor.
11. Vibration safety switch.
12. Provide eye hooks for rigging
13. Correctional package

ITEM 6: MOBILE FOLDING TABLE
Manufacturer: Eagle Group
Model: Adjustable Series
Furnish and set-in-place in accordance with Part-2 Products, Plans and Details.
1. Length, width and configuration per plan and verified room dimensions.

ITEM 7: DETERGENT PUMP
Provided by Vendor, Not in LEC Contract

ITEM 8: SHELVING
Manufacturer: New Age
Model: HD Series 72-Five Tier
Alternate: Metro, Eagle Group
Furnish and set-in-place in accordance with Part-2 Products, Plans and Details.
1. 72” posts with five (5) tiers.
2. Length, width and configuration per plan and verified room dimensions.

ITEM 9: 75 LB. DRYER
Manufacturer: Unimac
Model: UT75
Alternate: Dexter
Furnish and set-in-place in accordance with Part-2 Products, Plans and Details.
1. Reversing/non-reversing control.
2. Minimum dry weight capacity of 75 lbs.
3. Microprocessor computerized controls.
4. Automatic back draft damper.
5. Heavy gauge stainless steel drum.
6. Drum to be supported and driven via roller wheels.
7. Thermal overload protection.
8. Water connection for internal fire control system; required.
9. Correctional package

ITEM 10: LINT COLLECTOR
Manufacturer: Clean Cycle Systems
Model: OPL-203
Furnish and set-in-place in accordance with Part-2 Products, Plans and Details.
1. Assembly to accept ductwork from Item 9 - Dryers. Duct work and final connections provided by Mechanical Division
2. All S/S construction.
3. Variable drive.
4. Variable speed drive option to be coordinated and installed by Division 15
5. Air blow down system.
6. Fire protection control system.
7. Pre wired pre plumbed option
8. Wall mounted control panel. Interconnection wiring by Electrical Division.
9. Unit to be floor mounted in position as shown on plan coordinate legs and height with ductwork, etc.
10. Provide lint chute and lint bag(s).
11. Provide air reservoir with all valves and fittings
12. UL control box
13. Fasten to adjacent wall for stability.

ITEM 11: MOBILE INTAKE CARTS
Manufacturer: New Age
Model: HD Series 72-Four Tier
Furnish and set-in-place in accordance with Part-2 Products, Plans and Details.
1. 72” posts with five (4) tiers.
2. Length, width and configuration per plan and verified room dimensions.

ITEM 12: NOT USED

ITEM 13: NOT USED

ITEM 14: NOT USED

ITEM 15: NOT USED

END OF SECTION

SECTION 11 40 00

FOODSERVICE EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION:

A. The conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

B. Work to be provided and installed includes, but is not limited to:

1. Furnish all labor, materials and services necessary for the assembly and setting in place of the equipment in strict compliance and in accordance with the contract documents.
2. Cut holes; provide sleeves for pipes on equipment, for drains, electrical, plumbing, etc., as required for proper installation.
3. Repair any damage resulting from installation.
4. Remove all debris resulting from this installation, clean and all equipment for operation, as well as an acceptance test by the Owner.
5. Restore damaged fire rated assemblies to their original fire rating with approved materials.
6. Coordinate and schedule required inspections, permitting and reviews with County Environmental Health Department and Fire Marshal

1.2 WORK PERFORMED BY SECTIONS OTHER THAN FOODSERVICE EQUIPMENT

A. Mechanical and Plumbing and Utilities: Mechanical and Plumbing rough-in; ducting, piping and final connection between rough-in and equipment; installation of mechanical and plumbing devices and fittings in utility lines; interconnecting field ducting and piping between foodservice equipment and components; exhaust ducts, exhaust fans, indirect waste lines, floor cleanouts and floor sinks.

B. Electrical rough-in; conduit, conductors and final connection between rough-in and equipment; installation of electrical fittings and devices in utility lines; interconnecting field wiring between foodservice equipment and components; circuit breakers panels other than those integral with foodservice equipment; final disconnect means.

1.3 CONTRACT DOCUMENTS

A. Equipment drawings are definitive only and should not be used as construction documents or shop details.

B. Drawings and equipment specifications are intended to compliment each other. Therefore, neither should be considered complete without the other.

C. Drawings are for reference, assistance and guidance only. They indicate the preferred final location of equipment. The exact final location will be dictated by the building conditions.

D. Drawings shall govern for quantity and specifications for quality.

1.4 SUBSTITUTIONS

A. Equipment shall be as specified by specific manufacturer, model number, size, utilities requirement, capacity, as well as options and accessories.

B. Wherever the term “Alternate” follows the description of an item of commercial factory-manufacture it shall mean that the manufacturer listed as an alternate are approved for methods of manufacture only and not for their catalogued items without modification. The prime specified model shall govern in matters of capacity, fuel consumption, voltage and phase, overall dimensions, materials, function, and accessories. In all cases, categories of equipment of substantial quantity shall be of the same brand insofar as to limit the responsibility of Guarantee and Warranty.

C. Contractor may present alternate equipment other than those specified as prime or acceptable alternate. Contractor shall clearly and separately state prior to bid opening that he is offering a substitution. He shall submit complete illustrations, specifications, capacities, and utilities, as well as operational data. It is Contractor’s responsibility to prove that the item or items substituted are equal to the specified items. Items of standard equipment shall be the latest model, new at time of delivery.

D. Contractor shall be responsible for all costs associated with the acceptable alternate or approved alternate items, if the item requires additional space or specific utilities that differ from specifications or drawings. Contractor shall be responsible for any retrofitting such as building changes, utility changes and engineering changes. All substitutions must be approved prior to the bid date.

1.5 LAWS AND ORDINANCES

A. Certify that all work and materials comply with Federal, State and Local laws, ordinances and regulations and is confirmed by the local inspector having jurisdiction.

B. Work and materials must be in full accord and when appropriate, shall be listed with the following agencies:

1. Local Health Department
2. National Sanitation Foundation (N.S.F.)
3. Underwriters Laboratories (U.L.) or ETL equivalent
4. A.G.A.
5. N.F.P.A. – latest edition, for exhaust system

C. Check and confirm that drawings and specifications meet all Federal, State and Local Government bodies. The drawings and specifications shall govern wherever they require larger sizes or higher standards than required by local agencies and regulations. The regulation shall govern when drawings and specifications indicate less than the required regulation. Owner shall not be held responsible or be charged extra charges related to code compliance.

1.6 QUALITY ASSURANCE

A. Qualifications

1. Foodservice Equipment Contractor (FSEC) and its sub-contractors to have at least 5 years experience in this type of work. Upon request provide at least three references for jobs of similar size and content.
2. Commercially manufactured equipment is not acceptable unless evidence furnished that similar equipment has been operating successfully in a minimum of three (3) installations (excluding testing laboratories, field-testing or prototypes) for at least one (1) year.
3. Commercially manufactured equipment will be reviewed based on submittal data provided on manufacturer's literature and/or manufacturer's shop drawings for prime alternate or substituted items. Failure of the equipment to meet the capacity, operation, size, utility and production as submitted will result in the rejection of the equipment regardless of disclaimers.
4. Custom-fabricated equipment shall be manufactured by a foodservice equipment fabricator with at least five (5) years experience in this type of work, who has the plant, personnel, and engineering facilities to properly design, detail and manufacture high quality foodservice equipment.

B. Requirements of Regulatory Agencies:

1. NSF Compliance: All equipment subject to NSF approval shall be so labeled, or shall be constructed in accordance with applicable published NSF standards.
2. Refrigerating Equipment: Conform to all applicable ASHRAE Standards. Evaporators NSF approved; electrical components UL (or ETL) approved.
3. Electrical Equipment: Equipment shall carry UL (or ETL) approval and comply with applicable standards of the National Electric Code. Where specified, items shall be UL approved as a unit; if not, specified component electrical parts shall be approved separately. Where applicable, equipment shall comply with NEMA and NBFU standards. Where local regulations permit, a certified test report by an approved nationally recognized independent testing organization establishing proof of conformance to the standards, including test methods of UL, will be considered in lieu of UL label.
4. Civil Authorities: Comply with all ordinances, codes and regulations of civil authorities having jurisdiction at Job Site.
5. Sheet Metal Fabrication: Comply with NFPA standard No. 51 (Current Edition 2018-CFC Chapter 80 Reference Edition 2018): "Welding and Cutting"; and applicable NSF standards.

6. ADA Compliance: Installation and construction of equipment and furnishings to comply with the American Disabilities Act as described in the Department of Justice Register Volume 56, No. 144.

7. Seismic Installation: Verify requirements per OSHPD compliant anchoring, restraining and seismic attachments.

1.7 GUARANTEE AND WARRANTY

A. All equipment shall be fully guaranteed against defects in workmanship and material for one (1) year after Owner's final acceptance. All repairs and replacements shall be made without charge to the Owner. Guarantee period shall commence with the first usage of the equipment for the intended purpose after final acceptance. Also see additional guarantee required for refrigeration equipment.

1.8 EQUIPMENT ACCESS

A. Verify all building conditions and coordinate proper access of large equipment to the building. Any specific items needed for the movement of large, heavy or bulky equipment is the full responsibility of the Contractor.

1.9 SUBMITTALS

A. Contractor to submit two (2) bond print for review, after which, Contractor will receive one (1) of the reviewed sets for printing and distribution. Electronic submittals are NOT acceptable unless prior approval, during the bid process, from the Consultant and Architect is obtained. All submittals; Shop Drawings, Rough-In Drawings and Equipment Brochures, must be delivered as one complete package.

B. Shop Drawings:

1. Shop drawing of all custom fabricated equipment shall be submitted at ¾ inch scale. All custom fabrication shall have dimensions, fabrication, materials, thickness, and details of construction, installation and method of field joint. Shop details indicate reinforcements, methods of anchorage and quality of finishing.

2. Verify all field dimensions and incorporate them into shop details.

C. Rough-in Drawings: Rough-in drawings shall be submitted and show every piece of equipment, all dimensions for rough-in points for electrical, plumbing, steam, exhaust, gas, refrigeration, beverage conduits, as well as concrete curbs, sleeves, supports and any core drilling required. Check and confirm that all equipment requirements have been shown in contract documents, included in rough-in drawings and coordinated with specified, alternate and/or substituted equipment being provided.

D. Equipment Brochures: Assemble and bind Equipment Brochure books as part of submittal. All equipment cut sheets shall clearly show all specified accessories, utility requirements and any other pertinent information; four (4) required.

1.10 START-UP DEMONSTRATION AND MANUALS:

A. Provide factory-trained engineers for start-up and demonstration of equipment. Demonstration shall be done in two stages: One for operation and the second for maintenance personnel.

B. Return to the job site within 10 days for final adjustment and calibration of equipment.

C. Furnish service parts manuals as well as maintenance manuals.

D. Prepare list of service agencies authorized by the manufacturer to service its equipment. Include the name of the person to contact and a telephone number.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS OF FABRICATION

A. Fabrication shall conform to general acceptance of the foodservice industry.

B. Fabrication shall meet or exceed National Sanitation Foundation standards including the latest editions and revisions.

2.2 MATERIALS

A. Stainless Steel (S/S): Stainless steel shall be of U.S. Standard-gauges as indicated, but not less than 18-gauge or as noted, Type 304 with No. 4 finish.

B. Galvanized Steel: Galvanized steel shall be of 14-gauge and shall be electro galvanized. Galvanized steel shall be used in non-exposed areas, areas, which have no contact with food or food serving items and in framework, when used in framework, galvanized steel shall be, welded construction.

C. Laminated Plastic (L/P):

1. Shall be Formica, Parkwood, LamiArt, or approved equal.
2. Shall be veneered with approved waterproof and heatproof cement. Rubber base adhesives are not acceptable.
3. Shall be applied directly over ¾-inch plywood.
4. Exposed faces and edges shall be faced with 1/16-inch thick material. Corresponding backs shall be covered with approved backing and balancing sheet material.

D. Solid Surface Material (SSM):

1. Shall be Caesarstone, Silestone or approved equal and installed over ¾-inch plywood per manufacturers' instructions. Provide air space, trim and/or insulation around any heat or cold producing equipment to guard against discoloration and cracking.

E. Sealants and Adhesives: Refer to "Sustainable Design Requirements" for VOC limits for products used inside and applied on-site.

F. Certified Wood: Provide wood that is certified by the Forest Stewardship Council (FSC).

2.3 METAL TOP CONSTRUCTION

A. Metal tops shall be one-piece 14-gauge welded construction, including field joints. Secure to a full perimeter galvanized steel channel frame cross-braced not farther than 30 inches on center. Fasten top with stud bolts or tack welds. All exposed leading top edges to have “highlighted” #8 finish.

2.4 ENCLOSED CABINET BASES

A. Bases shall be fabricated from not less than 18-gauge steel reinforced by forming the metal ends and shelves. Partitions shall be all of stainless steel. The ends and vertical partitions may be of single wall construction, with a 2-inch face, all partitions and sides shall be welded in the intersection and flush with the bottom.

B. Unexposed backs and structural members may be constructed of galvanized steel.

C. Intermediate shelves shall be removable, except the bottom shelf when the cabinet is on legs. When the cabinet is on a masonry base, the bottom shelf shall be removable to allow access for cleaning.

2.5 LEGS AND CROSS RAILS

A. Legs and cross railings shall be 1-5/8-inch, 16-gauge stainless steel tubing. All cross rails shall be continuously welded, grounded and polished. Tack welds or other methods of connection are not acceptable. Bottoms of legs shall be wedged inward and fitted with a stainless steel bullet type foot with not less than 2-inch adjustment. Freestanding legs shall be pegged to floor with ¼-inch stainless steel rod.

B. Stainless steel gusset shall be not less than 3-inch diameter at top and 3-3/4-inch long. Outer shell 16-gauge stainless steel reinforced with 12-gauge mild steel inserts welded interior shell. Gusset shall be large enough to accommodate 1-5/8 inch tub with provision for Allen screw fastener.

C. Low counter leg shall be constructed of stainless steel exterior of 5-3/4 inch minimum height or 7 inch maximum height with 3-1/2 inch square plate with four countersunk holes, welded to the top for fastening.

D. Adjustable foot shall be constructed of stainless steel 1-1/2 inch diameter tapered at the bottom to 1-inch diameter, fitted with treaded cold rolled rod for minimum 1-1/2 inch by ¾-inch threaded bushing plug welded to legs.

E. When legs are fastened to equipment, the following methods should be used.

1. Sinks: Reinforced with bushings and set screws.
2. Metal Top Table or Dishtable: Welded to galvanized steel frame of 14-gauge or more and secure to the top with screws through slotted holes.
3. Wood or Composition Top: A welded stainless steel channel of not less than 14-gauge, secured to the top with screws through slotted holes.

2.6 SHELVES

A. When shelves are part of the fixture, the following shall take place.

1. Open base type shelf shall be notched around the leg and continuously welded to the leg.

2. Cabinet base type shelf shall be turned up on the back side a minimum of ¼ inch radius and further slightly to insure a tight fit to enclosure panels.

B. Wall shelves shall be one-piece 16-gauge welded construction, including field joints. Secure walls with 14-gauge S/S brackets at 36-inch on-center maximum. All exposed leading edges to have “highlighted” #8 finish.

C. Over-shelves shall be one-piece 16-gauge welded construction, including field joints. Secure to 1-inch tubular supports at 60-inch on-center maximum attached to counter tops. All exposed leading edges to have “highlighted” #8 finish.

2.7 SINKS

A. When multiple compartments are part of the design, they shall be continuous on the exterior without applied facing strips or panels. Bottoms of each compartment shall be creased such as to ensure complete drainage to waste opening.

B. Partitions between compartments shall be double thickness continuous and welded.

C. Where sink bowls are exposed, the exterior shall be polished to a number 4 finish.

D. Fabricator shall provide drains, wastes and faucets as indicated on drawings, or itemized specifications

2.8 OTHER FABRICATED COMPONENTS

A. Casters:

1. Shall be heavy-duty type, ball bearing, solid or disc wheel with non-marking greaseproof rubber, neoprene or polyurethane tire.

2. Wheel shall be 5-inch diameter, minimum width of tread 1-1/2-inch, with a minimum capacity per caster of 250 pounds.

3. Solid material wheels shall be provided with stainless steel rotating wheel guards.

4. Shall be sanitary, have sealed wheel and swivel bearings and polished plate finish

B. Doors:

1. Metal doors shall be double cased stainless steel. Other pans shall be 18-gauge stainless steel with corners welded, ground smooth, and polished. Inner pan shall be 20-gauge stainless steel fitted tightly into outer pan with a sound deadening material such as Celotex or Styrofoam used as a core. The two pans shall be tack welded together and joints solder filled. Doors shall finish approximately ¾-inch thick and be fitted with flush recessed type stainless steel door pulls.

2. Sliding doors shall be mounted on large, quiet ball bearing rollers in 14-gauge stainless steel overhead tracks and be removable without the use of tools. Bottom of cabinet shall have stainless steel guide pins and not channel tracks for doors.
3. Wood doors shall be fabricated as detailed. If Formica or other plastic surfaces are used, all sides shall be laminated.
4. Hinged doors shall be mounted on heavy-duty N.S.F. approved hinges, or as noted on plans or specifications.

C. Hardware:

1. Shall be solid, heavy-duty type.
2. Door hardware shall be locking type, keyed and master keyed.
3. Shall be identified with manufacturer's name and number so that broken or worn parts may be replaced.
4. Submit samples for approval, when requested.
5. Pulls shall be Component Hardware or equal.

D. Drawer Assemblies:

1. Assemblies shall consist of removable drawer body mounted in a ball bearing slide assembly and padlock assembly.
2. Slide assembly consists of one pair of roller bearing extensions slides with side and back enclosure panels, front spacer angle, two drawer carrier angles secured to slides and stainless steel front.
3. Slides shall be 250-pound capacity made by Component Hardware Co., or equal.
4. Drawer bodies for general storage shall be 20-inch by 20-inch with Royalite containers.
5. Drawers intended to hold food products shall be removable type with 12-inch by 20-inch stainless steel assembly.
6. Drawer fronts are double cased ¾-inch thick, with 18-gauge stainless steel welded and polished front pan. Steel back pan is tightly fitted and tack welded. Sound deaden with rigid insulation.
7. All drawers shall be provided with replaceable soft neoprene bumpers or, for refrigerated drawers, a full perimeter soft gasket.

2.9 FABRICATED WORKMANSHIP

A. Items of specially fabricated equipment shall be fabricated by an acceptable manufacturer, which is N.S.F. approved and fabricated in an approved manner to the complete satisfaction of the Owner.

1. Welding and Soldering:
   a. Materials 18-gauge or heavier shall be welded.
   b. Seams and joints shall be shop welded or soldered as the nature of the material may require.
   c. Welds shall be ground smooth and polished to match original finish.

d. Where galvanizing has been burned off, the weld shall be cleaned and touched up with high-grade aluminum paint.

B. Fasteners and Joints:

1. The following will not be accepted:

a. Exposed screw or bolt heads.

b. Rivets.

c. Butt joints made by riveting straps under seams and then filled with solder.

C. Rolled Edges: Rolled edges shall be as detailed, with corners bull nose, ground and polished.

D. Coved Corners: All stainless steel foodservice equipment shall have ½-inch or larger radius coves in all horizontal and vertical corners and intersections per N.S.F. standards.

E. Closures: Where ends of fixtures, splashback, shelves, etc. are open, fill by forming the metal, or weld sections, if necessary, to close entire opening flush to walls or adjoining fixtures.

2.10 OPERATION REQUIREMENTS

A. Insure quiet operation of foodservice and related equipment.

B. Insure the bumper gaskets stop and any other needed protection is installed on all fabricated equipment as needed.

2.11 COLD STORAGE ROOMS

A. Pre-fabricated, pre-assembled, sectional, size and configuration as shown on plan, and as verified by field dimensions, with largest possible area provided.

B. Check job site before installation of walk-in cooler to verify proper dimension for all trim pieces.

C. General Federal and State Code Requirements and Standards

1. Automatic door closing device.

2. Strip curtains.

3. Double pane view windows in Cooler doors, triple pane view windows in Freezer doors.

4. High efficiency lighting or automatic light switches.

5. Efficient defrost system for glass reach-in doors.

6. R-25 insulation in Cooler walls, doors and ceilings. R-32 insulation in Freezer walls, doors and ceilings. R-28 Insulation in Cooler/Freezer floors.

7. Capable of accepting penetrations for the installation of automatic fire sprinklers.

D. Construction:

1. Interior and exterior metal skins formed with steel dies and roll-forming equipment. The metal skins shall be placed into steel molds and liquid urethane injected between them. Urethane shall be foamed in place (poured, not frothed) and, when completely heat-cured, shall bond to the metal skins to form a rigid thick insulated panel
2. Panels shall be equipped with “Cam-Lok” joining devices. The distance between locks shall not exceed 48-inch, or as specified. Press-fit caps shall be provided to close wrench holes.
3. Exterior and interior finish per itemized specifications.
4. Perimeter door heater fitted with low-conductor, anti sweat heater wires, fully enclosed in metal, easily replaceable, for freezer compartments.
5. All interior joints coved ¼-inch minimum radius.
6. All conduit and switch/alarm J-boxes to be pre-installed in panel sections with recessed splice boxes at exterior ceiling panels.
7. Doors:
    a. Height per plan by 78-inch hinged flush swing type door, or as specified/shown on plans, and 4-inch insulation same as panels. 14-inch by 24-inch view windows in all doors, heated on freezer doors. Interior and exterior diamond 30-inch tread kick plate.
    b. Chrome-plated positive door-latch and handle with interior safety release and mortise deadbolt lock assembly.
    c. Three (3) hinges per door, NSF-approved, chrome-plated, self-closing from a 90-degree open position, cam-action.
    d. Hydraulic door closure equal to Kason 1094.
    e. All doors accessing walk-ins are to have locks keyed alike.
8. A heated relief port shall be provided at freezer to equalize the difference of pressure between the interior and walk-in.
9. Fluorescent light fixtures lamps with base Lexan diffuser controlled by interior/exterior light switch (3-way or 4-way).
10. Digital temperature alarm system, with constant “LED” read-out display, audio warning buzzer, and remote sensor, with high-low setting and twisted pair data capability, equal to Modular Corp. Model # 75.

E. Provide drop-in closure panels to finished ceiling and permanently mounted trim strips (of material to match exterior panel surfaces) to adjacent walls and equipment.

2.12 REFRIGERATION SYSTEM

A. Assembly to consist of compressors, condensers and evaporators, as required for the Coolers/Freezers and any accessories required for a completely installed and functional system.

B. Pre-assembled remote refrigeration:

1. Condenser shall be sized to a minimum of 15 degree Fahrenheit TD, medium temp and low temp compressors. Condenser coil shall be constructed of seamless copper

tubes arranged in a staggered pattern and mechanically expanded into high efficiency rippled aluminum fins for maximum heat transfer or as specified.

2. Provide pump-down cycle kits, refrigeration lines, insulation, thermo-expansion valves, refrigerant, pressure relief valves and inlet/outlet shut-off valves.

C. All weather enclosure.

1. The compressor housing shall be a weatherproof cabinet primed and painted on a heavy-gauge steel frame mounted on heavy-gauge steel.
2. All refrigeration lines to be insulated and extended thru ceilings and concealed spaces as required.

D. Refrigeration systems shall include start up and one-year service and maintenance contract in addition to the regular one-year guarantee as stated in the General Conditions, plus, an additional four (4) year pro-rated guarantee on compressors. This includes refrigerators, ice cream cabinets, icemakers, freezers, dispensers, or any other refrigerated items.

2.13 EXHAUST HOODS

A. Install assemblies in the location as indicated on drawings. It is the responsibility of the Installer to verify all clearances and stand offs from the hood to limited-combustibles and/or combustible materials. Hood must be installed in accordance with the Manufacturer's specifications. Canopy Hoods to be installed a minimum of 80 inches above the finished floor.

B. The hood assembly ends to be fabricated from 16 gauge stainless steel or heavier and have a continuous horizontal Performedge shape at the lower most part of the end. The remainder of the hood will be fabricated of material not less than 18 gauge. All exposed surfaces to be fabricated from Type 304 stainless steel with a #4 finish. All exposed welds to be ground smooth and polished to a #4 finish.

C. Provide matching stainless steel closure panels to finished ceiling, adjacent walls and spaces between hoods as required.

D. Rear and side 3” air space(s), if required must be full height of hood assembly and enclosed top, bottom and sides.

E. Hood assemblies must be manufactured UL 710 Listed, NFPA 96 compliant and installed in accordance with all prevailing codes and standards (Current Edition 2021-CFC Chapter 80 Reference Edition 2017).

F. Grease drip tray and container:

1. Full length concealed grease drip tray, kept to the minimum size needed to collect grease below the filters pitched to drain to a fully enclosed metal container with a capacity of less than 1 gallon. For Hoods that exceed 96" provide enclosed metal container on each end of the trough.

2. Grease collection container(s) may not protrude below the bottom of the hood.

3. Entire length of the grease drip tray to be accessible for easy cleaning.

G. Permit holder shall verify capture and containment performance of the hoods per CMC 511.2.2.2

2.14 FIRE PROTECTION SYSTEM

A. The fire protection system must be UL 300 Listed , NFPA 17A compliant and installed in accordance with all prevailing codes and standards (Current Edition 2021-CFC Chapter 80 Reference Edition 2017).

B. Provide all surface appliance, duct and plenum protection nozzles.

C. All exposed piping to be stainless steel, chrome plated or sleeved. Run unexposed wherever possible.

D. All piping must be installed by the Exhaust Hood manufacturer, no exceptions.

E. No horizontal piping within the canopy

F. No Exposed fasteners within the canopy

G. Manual pull station, location as shown on drawings, but shall be a minimum of 10 feet and a maximum of 20 feet from nearest edge of the exhaust hood. Coordinate with architect and local authorities if drawings show otherwise.

H. Assembly shall contain four (4) sets of normally open/closed contact points.

I. Provide electrically operated fuel gas shut off valve and electrical reset relay, when required, for equipment below hoods. Verify size with Plumbing Division.

J. Provide Y-Strainer that is approved for the mechanical removal of solids from pressurized gas lines which can be installed in a horizontal or vertical position. The Y Strainer to be manufactured of Carbon Steel and include a removable type 304 stainless steel Strainer with .016 inch perforations (#40 mesh). The Y Strainer to include a removable cap that allows the Strainer to be removed for inspection and/or cleaning when the gas line is not pressurized.

K. Coordinate with Plumbing Division for the Y-Strainer size and ANSI flanged or threaded pipe connection requirements. Plumbing Division to install the Y Strainer in accordance with the installation instructions

L. Upon completion the system must be tested and tagged in the presence of the enforcing agency.

2.15 ENCLOSURES

A. Provide and install enclosure panels secured or removable for any equipment that houses any equipment with movable parts for access. Also, cover and provide protection for any exposed steam line or condensate line that may be within reach of operating personnel.

2.16 ELECTRICAL WORK - GENERAL REQUIREMENTS

A. Before ordering equipment, confirm with the serving electric utility, all pertinent electrical requirements such as actual voltages available, number of phases and number of wires in the system. Coordinate also with any electrical service provide with other Divisions.

B. Components and assemblies shall bear the U.L., RU or ETL label or be approved by the prevailing authority.

C. Custom fabricated and standard refrigerator units shall be provided with vapor tight receptacles, shatterproof lamps and automatic switches. All wiring shall be concealed when possible.

2.17 INSERT PANS

A. All cut-outs, openings, drawers, or equipment specified or detailed to hold stainless steel insert pans shall be provided with a full compliment of pans as follows:

1. One stainless steel, 20-gauge minimum, solid insert pan for each space, sized per plans, details or specifications.
2. Where pan sizes are not indicated in plans, details or specifications, provide one full size pan for each opening.

3. Provide maximum depth pan to suit application and space.
4. Provide 18-gauge removable stainless steel adapter pars where applicable.

2.18 CORDS AND PLUGS

A. Where cords and plugs are used, they shall comply with National Electrical Manufacturer's Association (N.E.M.A.) requirements.

2.19 WATER FILTERS

A. Provide filters on all icemakers, contractor provided beverage equipment, and steamers.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION OF EQUIPMENT

A. Supervision: A competent superintendent, representing the Contractor shall be present during progress of the work.

3.2 TRIMMING AND SEALING EQUIPMENT

A. Any space between units to walls, ceilings, floors and adjoining units, not portable, shall be completely sealed against entrance of food particles or vermin by means of trim strips, welding, soldering, or commercial joint material suitable to the nature of the equipment.

B. Sealer, when not exposed to extreme heat, shall be silicone construction sealant in appropriate color.

C. Ends of hollow sections shall be closed.

D. Enclosed fixtures without legs mounted on masonry bases or floor shall be sealed watertight to base or floor.

3.3 CUTTING AND FITTING

A. Cutting and fitting required on the equipment by subcontractors to make their work fit.

B. Should any repairs to foodservice equipment be required due to neglect of other contractors, all extra charges and all anticipated repairs shall be noted in writing before work is performed. In case this Contractor does not follow this procedure, the expense shall be borne by him.

C. No cutting, notching, drilling, or altering of any kind shall be done to the building without first obtaining permission.

3.4 PROTECTION OF EQUIPMENT

A. Be responsible during the progress of the project to protect equipment against theft and/or damage until final acceptance.

B. Prefabricated walk-in boxes, on-site and installed in advance of the rest of the equipment, shall not be used for general storage by other trades and shall be locked

before leaving the site. Damage and/or theft resulting from failure to secure boxes will be repaired/replaced at Contractor's expense.

3.5 ITEMIZED LIST OF EQUIPMENT (ISSUED WITH CONSTRUCTION DOCUMENTS)

END OF SECTION

SECTION 11 98 00

DETENTION EQUIPMENT CONTRACTOR

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Detention Equipment Contractor.

B. Suppliers.

C. Installers.

1.2 RELATED SECTIONS

A. Section 07 92 00 – Joint Sealants: Security sealants.

B. Section 11 98 12 – Detention Doors and Frames.

C. Section 11 98 14 – Detention Door Hardware.

D. Section 11 98 15 – Detention Security Glazing.

E. Section 11 98 16 – Detention Fasteners.

F. Section 11 98 19 – Detention Room Padding.

G. Section 11 98 21 – Detention Exterior Window Frames.

H. Section 11 98 21.13 – Electrically Operated Detention Windows.

I. Section 11 98 23 – Detention Mesh Screen.

J. Section 11 98 26.13 – Detention Metal Personnel Lockers and Equipment.

K. Section 11 98 26.16 – Detention Lockers.

L. Section 11 98 33 – Detention Security Ceiling Assemblies.

M. Section 11 98 36 – Detention Furnishings.

N. Division 26 – Electrical.

O. Division 28 – Electronic Safety and Security.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM A36 – Structural Steel.
2. ASTM A366 – Steel, cold rolled.
3. ASTM A526 – Galvanized Steel.
4. ASTM A569 – Commercial Grade, hot rolled and pickled steel.
5. FS FF-S325 – Expansion Anchors, and Anchor Bolts.
6. FS QQ-A325 – Finish for Wedge Type Expansion Anchor.

1.4 SUBMITTALS

A. Submit shop drawings under provisions of Division 01.

B. Submit complete shop drawings for fabrication, erection and installation of all items of detention equipment. Include plans, elevations and large scale details where applicable. Show anchorage and accessory items, and include electrical junction boxes, conduit and wiring locations and connections, to insure a complete and proper installation. All shop drawings shall be referenced to Architect's Door Schedule, Glazing Schedule, Detail Numbers and Hardware Group as applicable. All delays and time overruns caused by incomplete submittals may be assessed to Contractor.

C. Coordinated shop drawings shall include materials and installation of all Division 11 Detention Specification Sections, and shall be coordinated with all other related Sections including those listed above in Article 1.2, Related Sections.

D. Submit product data under provisions of Division 01.

E. Submit manufacturer's product data and installation instructions for each standard equipment and hardware item.

1.5 OPERATIONS AND MAINTENANCE DATA

A. Submit operation data under provisions of Division 01.

B. Detention equipment manufacturer shall furnish operating and specifications manuals for all detention equipment and provide instruction for the care of finishes and materials.

1.6 QUALITY ASSURANCE

A. The Detention Equipment Contractor shall be responsible for:

1. Providing and installing all items and equipment specified in all Division 11 Detention Specification Sections.
2. Installation of Owner-furnished Detention Equipment.
3. Coordination of all interfaces of his work with fabrication and installation of items specified in Sections listed in Article 1.2, Related Sections.
4. Compliance with all requirements as listed in each section of specifications for which he is responsible.

B. The Detention Equipment Contractor shall exhibit the following qualifications: Subcontract the provision of detention equipment to a single firm. The firm shall meet the following minimum requirements:

1. Detention Equipment Provider shall be regularly and presently engaged in the design, fabrication, and installation of detention equipment as one of its principal products.
2. Detention Equipment Provider shall have technically qualified, experienced and trained personnel, with a minimum of five years' experience, to install specified items.
3. Detention Equipment Provider shall have executed as least five separate detention and/or correction projects equal or greater in size than this Project which embody the same type of detention equipment as proposed for this Project. These Projects shall have been in actual and satisfactory use for not less than one year.

C. Proposals will be considered only from competent and reputable companies who specialize in this particular service and who can show to the satisfaction of the Architect that they are fully capable of completing detention equipment-type work in accordance with these construction documents.

D. Detention Equipment Contractors shall provide the following information to obtain approval of qualification:

1. Brief description of the firm including length of time in business.
2. List of all projects the firm has worked on in the last five years. List Title, Location, Owner Contact, General Contractor, Architect, services provided and dollar value of your service. Identify those projects of equal size and service to this project.
3. List of five references with phone numbers who can attest to your qualifications, expertise and quality of work.
4. Résumés of key personnel within your company and of those who will be involved with this project as a manager, fabricator or installer, along with each person's particular expertise and years of service.
5. Provide a brief financial statement describing the stability of the company.
6. Provide a letter from Surety Company outlining bonding capabilities, overall limit and current bonds outstanding. List occurrences in the last five years where a bonding company was drawn upon to complete any work on your projects.
7. If you propose subcontracting any of your services, provide information and bonding capabilities on this subcontractor.
8. Provide a list of services you propose to provide as part of this project. Include also a list of those services you will specifically exclude from this project.
    a. Acceptance of a firm as Detention Equipment Contractor does not relieve them from furnishing all materials and services required by the Contract Documents.

E. Qualification of Detention Equipment Subcontractors: Use only subcontractors acceptable to all detention equipment manufacturers and to the Detention Equipment Contractor. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts, who are completely familiar with the specified requirements and methods needed for proper performance of the work.

F. Qualifications of Manufacturers: Products used in the work of these Sections shall be produced by manufacturers regularly engaged in manufacture of detention equipment and with a history of successful production acceptable to the Architect.

G. Furnish all items to be embedded in other work. Include instructions for placement. Review installation of embedded items and report status of installation to the Architect.

H. Detention Equipment Contractor shall perform final field installation of detention doors, hardware, and other detention equipment.

PART 2 PRODUCTS

2.1 MATERIALS

A. General:

1. The manufacturers, suppliers and warrantors shall make special efforts to comply with General Contractor's scheduling requirements with regard to early delivery of hollow metal frames and other items needed to proceed with adjacent or related work.
2. The Detention Equipment Contractor is responsible for providing detention equipment detention metal frame assemblies, complete with all products required, for putting in operable condition all items of work and for furnishing all items required for complete installation of products including anchors, and other necessary fasteners/accessories for anchorage as required by conditions of installation.

B. Materials, Components and Fabrication: Comply with requirements in each Section of detention equipment and/or furnishings; provide direct to Contractor each type of detention equipment only from a "single" detention equipment contractor.

2.2 DETENTION EQUIPMENT CONTRACTORS

A. Detention Equipment Supplier/provider does not qualify as approved Detention Equipment Contractor. Detention Equipment Contractor must comply with Article 1.6 hereinbefore mentioned in order to qualify as an approved Detention Equipment Contractor.

B. Pre-Approved Detention Equipment Contractors:

1. Cornerstone Detention Products, 14000 AL-20, Madison, AL 35756, Tel: 256-355-2396.
2. Maximum Security Products Corp., S. 2406 Dishman Mica Road, Suite 3, Spokane, WA 99206, Tel: 509-928-5616.
3. Universal Security Products, Inc., 2010 Crow Canyon Place, San Ramon, CA 94583, Tel: 510-785-8222.
4. Montgomery Technology, Inc., 800 East Commerce Street, Greenville, AL 36037, Tel: 800-392-8292.
5. CML Security, 400 Young Court, Unit 1, Erie, CO 80516, Tel: 720-466-3650.
6. Capital Builders Hardware, Inc., 4699 24th St., Sacramento, CA 95822, Tel: 916-451-2821.
7. Or accepted equal.

2.3 OTHER MANUFACTURERS, SUPPLIERS

A. Substitutions: Under provisions of Division 01. In addition, submit:

1. Résumés of personnel in manufacturer's/supplier's organization that have sufficient documented experience in the design, fabrication and installation of equipment comparable in quality and type to that required herein, and a listing of not less than five projects, comparable in quality and type to this project, that have been executed under direction of said personnel.

2. Names and locations of detention installations completed within last year.
3. List of five separate jails equal in size or greater than this project which embody the same systems as proposed for use under these specifications and which have been in actual and satisfactory use under detention conditions and in continuous operation for at least two years.
4. Proposals will be considered only from competent and reputable manufacturers/suppliers who specialize in this particular branch of work and who can show to the satisfaction of the Architect that they are fully capable of completing detention equipment work in accordance with Contract Documents.
5. In the Contract Documents preparation, specific materials and methods have been described and drawn in order to establish a standard of quality and of effect desired. The Architect reserves the right to consider each request for substitution on merits of material furnished by any one manufacturer or supplier and to reject any or all requests which are not in Owner's best interest.
6. Provide a letter from Surety Company outlining bonding capabilities, overall limit and current bonds outstanding. List occurrences in the last five years where bonding company was drawn upon to complete any project.
7. Outline the following:
    a. Approved installers or list of persons within the firm that are currently installing products or services, with clarification of:
        1) How many years each person has provided this service and what particular product comprises his expertise. In other words, which portion(s) of this project do you propose he install? List each installer/product separately.
        2) How many installations of this size or larger have they completed?
        3) If you propose using a subcontractor for any portion of the installation, provide information of bonding capabilities, or how you will insure their work/liabilities.
    b. A critical path outlining time line from award of contract to delivery of your product on-site and installation/follow-up proposals.
    c. A complete list of what you consider to be your "standard" services and all miscellaneous appurtenances that you will provide for installation of your product, and its total function in a "standard" application.
    d. A list of all exclusions of materials that you interpret as not being a part of your contract.
    e. All warranty information on your particular product/service in a "standard" application.
    f. List of all technical/managerial staff that will assist on this project, the qualifications/experience of each on a project of this size, their particular involvement, and the number of years with your firm.

PART 3 EXECUTION

3.1 INSTALLATION

A. General:

1. Do not install products that are damaged or defective.
2. Securely anchor products in locations indicated on drawings, or as recommended by manufacturer and accepted by Architect.

a. Install in alignment, free from warp, twist or distortion, plumb, level and true.

b. Comply with reviewed shop drawings, manufacturer's instructions and recommendations for both handling and installation of the products for particular conditions of installation in each case, except:

1) Where more stringent requirements are indicated or specified.

2) Where project conditions require extra precautions or provisions for satisfactory performance of work.

3. Where printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding.

B. Cutting, Fitting and Placement

1. Perform cutting, drilling and fitting required for installation of detention equipment.

2. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels with lines visually parallel.

3. Cut necessary holes for installation of mechanical and electrical work in detention equipment; comply with templates or detail drawings furnished by other trades prior to fabrication and installation of detention work.

C. Provide all anchors and other attachment devices necessary to install Owner-furnished Contractor-installed detention equipment.

3.2 ADJUSTING, REPAIRING AND CLEANING

A. After connections to electrical power are made, test products to verify operational characteristics.

B. Adjust and lubricate moving parts to operate smoothly, quietly and without binding.

C. Remove from product surfaces the manufacturer's temporary labels, protective coatings and marks of identification if provided; thoroughly wash surfaces and remove foreign material.

D. After erection, prior to touch-up painting, remove objectionable foreign material from metal surfaces including connections. Where surfaces are to be exposed to view, grind welds smooth; finish holes, defects, and other imperfections so surfaces will be smooth when painted. Use metal body filler to fill joints at metal-to-metal joints or other gaps as directed by Architect including all joints or gaps in field assembled detention hollow metal items or detention equipment. Any gaps greater than 1/4 inch between detention hollow metal or detention equipment and CMU walls to be closed with 1/8 inch steel angle or 1/8 inch steel plate and sealed with security sealant as appropriate for a neat installation. All gaps of less than 1/4 inch are to be sealed. This shall include all areas in secure perimeter as the Architect shall deem necessary.

E. Touch-up welds, bolted connections and all abraded/damaged areas in shop-applied finish with same type paint as metal primer used in fabrication shop.

F. Work shall be free from scratches, dents, permanent discoloration and other defects. Remove and replace damaged parts, and surfaces with imperfections, or items damaged during installation or thereafter before time of final project acceptance. Leave entire work in neat, orderly, clean condition.

3.3 PROTECTION

A. Protect products installed by detention equipment installer from damage.

3.4 EXTRA STOCK/SPARE PARTS

A. Provide six sets of special tools to manually operate motor controlled doors. Delivery shall be by registered mail direct to Owner.

B. Provide quantity of hardware specified in Section 11 98 14.

C. Provide at least three screwdrivers (or special wrenches, if applicable) for each size and type of countersunk flat security head metal screw.

D. Deliver extra stock/spare parts to authorized Owner's representative at project site packed in a carton to provide protection during transit and project site storage; store where directed and obtain written receipt when delivered.

3.5 INSTRUCTION AND TRAINING PERIOD

A. Provide operating/maintenance manuals and instructions as specified in the Contract.

B. Detention equipment supplier shall provide a representative acceptable to Architect and specially trained in operation of detention equipment, with thorough knowledge of its mechanisms, for an on-site instruction and training period involving Owner's designated personnel, which will not exceed five 8-hour days in length but shall be a minimum of three 8-hour days in length. Representative must be capable of training personnel in operation of detention equipment and instructing maintenance personnel in its operation, repair and upkeep. Detention equipment supplier shall obtain signatures from these designated personnel verifying their participation in this training, and shall forward this verification to Architect and Owner for review.

END OF SECTION

SECTION 11 98 12

DETENTION DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Detention hollow metal doors, frames, panels, windows, transoms, and sidelites, rated and non-rated.

B. Embedded anchor devices.

C. Electrical conduit and wire as specified in this Section only. Conduit and junction boxes occurring within panels, doors or frames are to be installed by this Section.

D. Miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-in-Place Concrete.

B. Section 04 22 00 – Concrete Unit Masonry: Setting of embedded items and grouting in frames.

C. Section 07 92 00 – Joint Sealants.

D. Section 08 11 13 – Hollow Metal Doors and Frames.

E. Section 09 91 00 – Painting.

F. Section 11 98 00 – Detention Equipment Contractor.

G. Section 11 98 14 – Detention Door Hardware.

H. Section 11 98 15 – Detention Security Glazing.

I. Divisions 25-28 – Electrical and Security Work.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM A36/A36M – Standard Specification for Carbon Structural Steel.
2. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

3. ASTM A615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
4. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
5. ASTM A1008/A1008M – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
6. ASTM A1011/A1011M – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
7. ASTM C476 – Standard Specification for Grout for Masonry.
8. ASTM F1450 – Standard Test Methods for Hollow Metal Swinging Door Assemblies for Detention and Correctional Facilities.
9. California Code of Regulations, Title 24, Part 12, 2022 California Referenced Standards Code – Chapter 12-7-4, Fire-Resistive Standards.
10. FS FF-S-325 – Expansion Anchors and Anchor Bolts.
11. FS QQ-A-325 – Finish for Wedge Type Expansion Anchors.
12. FS QQ-Z-325C – Plating of Anchorage Components. B. Stainless Steel Anchor Bolt Standards.
13. FS TT-C-490 – Cleaning Methods for Ferrous Surfaces and Pretreatments for Organic Coatings.
14. FS TT-P-664 – Primer Coating, Alkyd, Corrosion-Inhibiting, Lead and Chromate Free, VOC-Compliant.
15. NFPA Standard No. 80 – Standard for Fire Doors and Other Opening Protectives.
16. UL – Underwriters Laboratory.

1.4 SUBMITTALS

A. Submit shop drawings under provisions of Division 01.

B. Submit complete shop drawings for fabrication, erection and installation of all items of detention equipment. Include plans, elevations and large-scale details. Show anchorage and accessory items and include electrical junction boxes, conduit and wiring locations and connections, to insure a complete and proper installation. All shop drawings shall be referenced to Architect's Door Schedule, Glazing Schedule, Detail Numbers, and Hardware Group as applicable.

C. Submit product data under provisions of Division 01.

D. Submit manufacturer's product data and installation instructions for each standard equipment and hardware item.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit operation data under provisions of Division 01.

B. Detention equipment manufacturer shall furnish operating and specifications manuals for all detention hardware and all detention locking devices and provide instruction for the care of finishes and materials.

C. Detention equipment manufacturer shall, upon notice of the Architect and without additional cost to Owner, provide factory representatives specifically trained in operation of detention equipment with a thorough knowledge of its mechanisms, for a five working day instruction and training period. Factory representatives must be capable of training custodial personnel in operation, repair and upkeep.

1.6 QUALITY ASSURANCE

A. Detention equipment suppliers shall be pre-qualified by the Owner and provide the following information:

1. List the last five jobs completed along with the Owner's and General Contractor's names.
2. Show proof of completed schedule on past jobs.

B. Manufacturer: Provide detention equipment products and items produced by manufacturers who have sufficient documented experience in manufacturing equipment for maximum security and medium security installation.

C. Provide products of same manufacturer for each type of items or unit required. Provide each item as a unit, complete with all accessories, fittings, fastenings, anchorage, and devices necessary for items to correctly function for purpose for which intended.

D. Installation shall be performed by manufacturer or his authorized representative under the manufacturer's direct supervision.

E. Field Examination:

1. At the direction of the Architect, the Contractor shall destroy a randomly selected security hollow metal door or panel by sawing it in half.
    a. Test reports and documentation shall be in accordance with ASTM F1450.
2. If the examination reveals that the construction is in variance with the details or specifications, the door manufacturer shall replace all doors shipped to the project, as of the date of examination, with new doors constructed in conformance with the specifications. Under conditions of non-conformity, the door manufacturer shall pay for the destroyed door, related labor and all replacement costs.
3. If the door was constructed in conformance with the specifications, the Owner shall pay for the replacement of the destroyed door and the related labor.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Deliver detention and security equipment cartoned or crated to extent feasible.

C. Store in a protected location under cover with locks, operating and electrical devices in a securely locked room.

D. Store larger items on wood blocking under cover and out of the weather.

1.8 REGULATORY REQUIREMENTS

A. Wherever a fire-resistance classification is scheduled for a detention metal frame assembly, provide fire-rated metal frame assembly (complete with all products required) investigated and tested as a fire door assembly, complete with type of hardware to be used.

B. Identify each fire door and frame with mylar UL labels, indicating applicable fire rating of door and frame.

C. Construct and install assemblies to comply with NFPA Standard No. 80, and as herein specified.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Titan Steel Door – Murrayville, GA.
2. Trussbilt – Vadnais Heights, MN.
3. Sweeper Metal Fabricators Corp. – Drumright, OK
4. Willo Products Company – Decatur, AL.
5. Claborn Manufacturing Company (formerly Slate Security) – Hartsell, AL.

B. Substitutions: Under provisions of Division 01 and Section 11 19 00.

2.2 MATERIALS

A. Fastening Devices:

1. All exposed screws and nuts shall meet ASTM A307 – Grade A.
2. In areas where it is necessary to remove items from time to time, screws shall have slots or holes that require a special tool for removing same and must be such that standard tools will not fit.
3. Each type of fastener must be indicated on shop drawings.
4. All exposed screw fasteners shall be installed with Loctite, or accepted equal thread locking adhesive/sealant.

B. Anchorage Devices:

1. Weld Studs: TRW Division “headed” studs; weld to steel plates.
2. Wire Anchors: ASTM A615 grade 40 deformed rebar; weld to 10 gauge steel plates formed as required.
3. Steel Plate Anchors: Galvanized steel sheets formed as required; thickness, sizes as indicated.
4. Steel Plates: ASTM A36/A36M steel; form as required.
5. Expansion Anchors: FS FF-S-325 Group II, Type 3, Class 3 plated finish. Provide each anchor complete with bolt, expansion sleeve, hex nut, washer; 1/2 inch diameter size required with length as required for 4 inch minimum embedment depth, except where indicated to be longer.

6. Anchor Bolts Concealed From View: FS FF-S-325 Group II, Type 4, Class 1 wedge-type expansion anchors with FS QQ-Z-325C Type 1, Class 3 plated finish. Provide each anchor complete with bolt, expansion sleeve, hex nut, washer; 5/8 inch diameter size required with length as required for 2-3/4 inch minimum embedment depth.

2.3 DETENTION HOLLOW METAL DOORS AND PANELS

A. Construct of commercial quality, leveled, cold-rolled face sheets, ASTM A1008/A1008M, with interior vertical full-height steel reinforcing channels at 6 inches on center. Spot weld face sheets to each reinforcing channel at 3 inches on center maximum. Fill spaces between channels with mineral rock wool filler, six pound density. Exterior doors shall be galvannealed to ASTM A653/A653M A60. Note: Manufacturer's standard alternate interior door reinforcing may be acceptable. Submit complete information and details for approval in compliance with provisions of Division 01.

B. Doors and panels to be full flush design, 2 inches nominal thickness, sizes, type and elevations as shown on Drawings, schedules and approved shop drawings.

C. Metal Gauges:

1. Face Sheets: Medium Security – 12 Gauge.
2. Vertical Reinforcement: Medium Security – 12 Gauge.

D. Door Edges: Bevel vertical door edges 1/8 inch in 2 inches, reinforce full height with steel channels 1/8 inch thick, welded to both door faces at 3 inches on center maximum. Top and bottom reinforced full width with 10 gauge channels welded to vertical edge channels and to both door faces at 3 inches on center maximum. All edges shall be finished flush.

E. Openings in Doors: In maximum security doors and panels, all openings shall be reinforced to match door edges.

F. Maximum clearances between doors and frames:

1. 1/8 inch at head.
2. 1/8 inch at jamb.
3. 1/8 inch at vertical meeting edge of pairs of doors.
4. 5/8 inch under non-rated door with no threshold.
5. 3/8 inch under fire rated door with no threshold.
6. 5/8 inch under door with threshold.

G. Provisions for Hardware:

1. Mortise, cut, reinforce, drill and tap door edges to receive approved hardware. Comply with hardware manufacturer's recommendations and instructions.
2. Provide reinforced pocket to receive mortised locks. Protect lock with steel plates welded inside of door faces; 1/8 inch thick plates at medium security.
3. Provide reinforced seats, 1/8 inch and 3/16 inch thick, drilled, tapped and set back to the thickness of the face of the lock installed through door edge. Weld to edge channel. Cut away edge reinforcing channel only as necessary to pass the lock. Provide lock centering clips on each side of lock pocket. Cut out faces to pass cylinders, etc.

4. Provide a special pocket where prison locks are installed through the face of door: 3/16 inch thick steel reinforcing plate welded inside the detention side of pocket. Cut away outside face for lock installation. Secure lock to 3/16 inch steel plate furnished by lock manufacturer as per manufacturer's details. Frame around pocket to allow this plate to finish flush with surface of door. Secure plate with minimum of eight 1/4 inch security screws. Removal of lock shall be impossible when lock bolt is extended.
5. Cut hinge edge reinforcing channel only as necessary for mortise butts. At each hinge location, weld inside the edge channel a 3/16 inch x 1-1/2 inch x 10 inch reinforcing plate. At the top hinge location, reinforce with an additional channel welded to the plate inside the edge channel.
6. Full Reinforcing: Steel plate, 3/16 inch x 1-1/2 inches x 10 inches, welded inside door.
7. At all other surface hardware locations, reinforce with 14 gauge steel welded inside door.
8. Electrical Items: Where electrical wiring passes through the door for electric locks, electric hinges or limit switches, the required junction boxes conduit or raceway shall be provided and factory installed by the door manufacturer. The electrical wiring shall be furnished, installed and connected in the field by the Detention Equipment Contractor.

H. Openings in Doors:

1. All openings in doors shall be framed inside the door with 12 gauge minimum steel channels welded to both faces.
2. Provide non-removable glazing stop on detention side.
3. Provide pressed steel angle type glazing stops fastened with 1/4 inch diameter machine screws placed a maximum of 2 inches from ends of stops and a maximum of 6 inches on center.

I. Factory Finish:

1. Before Assembly: Clean and coat all surfaces with corrosion resistant iron oxide-zinc chromate primer.
2. After Assembly: Grind, fill and sand all surfaces and edges, bonderize or phosphate treat, then coat all exposed surfaces with rust inhibitive primer.

J. Hardware Installation:

1. Factory installed hardware includes dead bolts, mortise locks, protection plates, flush bolts, push plates, kick plates, key escutcheons, head bolts, steel bolt pocket in door and all mortise hardware.
2. Field installed hardware includes all projecting items such as pulls, knobs and handles. These items are installed by Detention Equipment Contractor.

K. Performance Tests:

1. Submit independent testing laboratory report on typical flush door. Include description of the test sample and all gauges of components.
2. Certify the door supported at both ends sustains a load of 13,000 pounds applied at quarter points with a maximum mid-span deflection of 0.50 inch for 3 foot x 7 foot doors and maximum security doors.
3. Certify the door fixed at one end and supported at one corner sustains a concentrated twisting force of 5,200 pounds applied to the unsupported corner with a maximum deflection of 2.55 inch for 3 foot x 7 foot doors and maximum security doors.

2.4 DETENTION PRESSED METAL FRAMES

A. Provide pressed steel frames for doors, security type transoms, sidelites, borrowed lites, observation, visitation, control, and security windows.

1. Exterior Frames: Commercial grade steel, 12 gauge, galvannealed to ASTM A653/A653M A60.

a. At the exterior side of door frame head, provide a 2 inch high galvanized steel rain drip in same gauge as frame. Rain drip shall extend across entire width of frame and be continuously welded to frame head. Refer to Drawings for detail.

2. Interior Frames: Commercial grade cold-rolled steel, ASTM A1008/A1008M or commercial grade hot-rolled and pickled steel, ASTM A1011/A1011M, 12 gauge.

3. All joints shall be fully mitered and continuously welded inside the miter across the full depth and width of the frame.

B. Mullion and/or Rail Members: Closed tubular shapes with no visible seams or joints. Weld all abutting members.

C. Furnish all frames as a single, complete unit where possible. Large frames may be furnished in sections with factory prepared splices. Show all field required splices and splice details on shop drawings.

D. Provisions for Hardware:

1. Mortise, reinforce, drill and tap at the factory for approved hardware. Comply with manufacturer's instructions and recommendations.

2. For mortise butts, provide full height 3/16 inch x 1-1/2 inch steel reinforcing plate offset at each hinge location, factory drilled and tapped. At top hinge, add a 3/16 inch backup angle welded to offset reinforcement and to the inside of frame trim.

3. Follow manufacturer's recommendation for lock or keeper preparation. Reinforcement: 12 gauge for medium security, 1/8 inch thick for maximum security. Protect all cut-outs and reinforcement with pressed steel mortar guards inside the frame.

4. Door closer reinforcement shall be 12 gauge one piece channel type, 2-1/2 inches deep by 14 inches long, actual configuration shall be verified with closer manufacturer.

5. 1/8 inch thick reinforcing tabs for all mortise strike areas.

E. Provisions for Electrical Locks:

1. Where electric locks occur in metal frames, the frame face and dimensions shall be modified as recommended by the lock manufacturer, as shown on the drawings, or if not indicated, then as follows:

a. Increase frame face width at the lock location to accommodate lock size or provide face width required to accommodate lock size or provide face width required to accommodate lock for full height of frame as indicated on drawings. Set face back to a frame depth of 3-13/32 inch minimum. Provide opening for face access installation on the non-secure side.

b. Enclose and form lock pocket with 14 gauge steel welded on all sides.

c. Provide lock mounting late at 3/16 inch steel inside the pocket welded to secure side of frame.

d. Provide 3/16 inch lock cover plate to close the face opening. Surface-mount the rounded edges. Fasten with twelve 1/4 inch #20 security screws.

e. Include the necessary holes for conduit, lock cylinder and other devices.

f. Electrical Items: All required junction boxes, conduit or raceway shall be provided and factory installed by door frame manufacturer. Factory install conduit in frame for electric power source to lock pockets and door position indicator switch. Install conduit from pocket vertically to top or bottom of frame. Verify location with electrical and electronics contractors for field conduit installation. Include conduit for communication intercoms located in frames. Coordinate size, locations and quantities required. The electrical wiring shall be furnished and installed in the field by electronics contractor with final terminations by Detention Equipment Contractor.

F. Provisions for Field Grouting:

1. Openings in Frames: Provide openings in all abutting mullions to facilitate free flow of grout to all frame members. At field welded frames in precast concrete walls with weld plates, provide 1-1/4 inch diameter holes at head frames to facilitate field solid grouting of frames.

a. Grout shall conform to ASTM C476.

G. Provide all frames with temporary spreader angles attached to the bottom of both jambs.

H. Glazed Openings in Frames:

1. Frames for glazed openings shall have non-removable stops on secure side and removable glazing beads on opposite side. Glazing beads shall be formed steel angles, size as shown on Drawings. Factory-drill beads for 1/4 inch diameter machine security screws at 2 inches maximum from each end and 6 inches maximum on center. Furnish all security screws and special tools.

2. Frames shall be provided with 1 inch minimum glass engagement or greater as required by glazing manufacturer and non-removable stops on the detention side and removable glazing beads opposite.

3. Glazing beads for medium security frames shall be formed steel channels to the depth shown, and of the same gauge as the associated frame. Glazing beads shall be factory drilled and countersunk for flat or oval head security screws and shall be secured at the factory with slotted flat head security screws.

4. Center pin rejection (Torx) security machine screws and special screwdrivers shall be furnished by the frame manufacturer for use to install glass and glazing in the field.

5. Where tool resistant (T.R.) bar passes through frame, ribs of bar shall be notched the thickness of material that bar passes through, and be rotated 90 degrees to form positive lock joint. Also, weld bar to frame where bar passes through.

6. Frame rabbets shall be additionally reinforced to engage at least four threads of the stop or head fastening screws.

7. Stop shall be painted to provide corrosion resistance on all surfaces including those concealed when stops or beads are in place.

8. Install glazing tape between metal stops and glass units. Refer to Section 08 88 53 for acceptable manufacturers and products. Glazing tape shall not extend above top of stops.

I. Security Framing for Control Room Framing and Miscellaneous Sidelites: Provide same material framing as specified above for security pressed metal frames with configurations and sizes as detailed on drawings.

J. Intercom System: Where intercom speakers are required, factory-install junction boxes and required conduit in frames as per intercom manufacturer's recommendations. Verify size and placement and indicate these on the shop drawings.

K. Frame Anchors: Locate jamb anchors at 8 inches from top and bottom and at 16 inches on center maximum. Locate head and sill anchors at 8 inches from ends and at 16 inches on center maximum where the masonry opening is 72 inches or greater.

1. Anchors at Masonry: 3/8 inch diameter wire anchor loops welded to 10 gauge steel plates or steel straps.
2. Anchors at Steel: 10 gauge zee welded to steel and frame.
3. Floor Anchors: 10 gauge plate welded to frame with adjustable anchor leg.
4. Provide and install frame stiffener plates, made of 10 gauge bent steel, at 8 inches on center each way in all frames with over 6 inches continuous width or height (one piece).

2.5 FINISHING

A. After assembly, smooth tool marks and surface imperfections by grinding, filling and sanding. Welded joints exposed to view and not continuously welded shall be filled with a metallic filler and ground smooth so as to show no exposed seam. This applies to both factory assembled and field assembled frame and detention equipment components.

B. Clean surfaces thoroughly of rust, oil and other impurities and phosphate coat to condition the surface in accordance with Federal Specification TT-C-490.

C. Coat all surfaces, both inside and outside the frame, to a minimum thickness of 1 mil with rust inhibitive red iron oxide-zinc chromate primer (equal to Federal Specification TT-P-664).

PART 3 EXECUTION

3.1 INSPECTION

A. Installer of detention equipment must examine the substrates, rough-ins and inserts related to installation of detention equipment and report in writing to the Contractor of conditions detrimental to the proper and timely installation of this work. Do not proceed until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 INSTALLATION

A. Detention Equipment:

1. Assemble units, which are not factory assembled. Set units in place and anchor to abutting construction as indicated and in accordance with final shop drawings.
2. Hollow metal frames and frames in masonry construction shall be set in place, anchored, and grouted under Section 04 22 00. Contractor shall provide visual verification of solid grouting by observing the frames being grouted. Grout shall be installed until it is released out of verification holes in glazing pockets. Contractor shall clean grout off directly after to avoid damage to frames.
3. Furnish inserts, anchors and templates for detention equipment that is to be built into concrete or masonry for installation under Section 03 30 00 and Section 04 22 00.
4. Install units plumb, square, properly aligned and securely anchored. Provide anchors, trim and accessories required for a complete, secure and functional installation.

5. Cut holes in detention equipment to accommodate plumbing lines as located by Plumbing Installer.
6. Make field connections, as detailed on final shop drawings. Perform welding using certified welders and grind all welds smooth.
7. Touch up welds and damaged areas with specified shop primer.

3.3 PROTECTION AND CLEANING

A. Handle all fixtures, materials, assemblies and equipment to avoid injury to persons and to avoid damage to work in place. Satisfactorily repair or remove and replace work that has been damaged.

B. Protect adjacent surfaces from damage and soiling.

C. Clean work under provisions of Division 01.

END OF SECTION

SECTION 11 98 14

DETENTION DOOR HARDWARE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hardware for detention and security doors and gates.

B. Accessories including but not limited to door stops, kickplates, and push/pull plates.

C. Weatherstripping, seals, and thresholds.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 07 92 00 – Joint Sealants.

C. Section 11 98 12 – Detention Doors and Frames.

D. Section 09 22 16 – Non-Structural Metal Framing.

E. Section 09 29 00 – Gypsum Board.

F. Section 09 91 00 – Painting.

G. Section 11 98 00 – Detention Equipment Contractor.

H. Divisions 26 through 28: Electrical rough in, wiring and connectors for electrified hardware including, but not limited to:

1. Wire and connectivity from ceiling through frame to electrified hardware devices including non-Section 11 98 14 task of providing wiring inside of doors.

I. Section 32 31 13.53 – High-Security Chain Link Fences and Gates.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Unless otherwise noted; standards, manuals, and codes refer to the latest edition as of the issue date of this Project Manual.

C. Conform to the following Referenced Standards and Regulatory Requirements:

1. CBC – 2022 California Building Code. All hardware shall meet the requirements of CBC.
2. PBS – P100 – Facilities Standards for the Public Buildings Service.
3. ADAAG – ADA Accessibility Guidelines for Buildings and Facilities (28 CFR, Part 36, Appendix A).
4. ANSI A117.1 – Guidelines for Accessible and Usable Buildings and Facilities. Conform to applicable requirements of the Americans with Disabilities Act Accessibility Guidelines regarding accessibility requirements for door and entrance hardware.

5. ASTM E283 – Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors.

1.4 COORDINATION

A. The hardware groups/sets specified in Section 11 98 14 - Part 3 are intended to establish type and design standard when used together with the requirements of this Section, Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections. Examine Contract Documents and furnish proper hardware for door openings. Refer to specifications for clarification and detailed requirements and provide products and services in specifications even if not written in hardware groups/sets in Section 11 98 14 - Part 3.

B. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware. In particular, coordinate door preparation in accordance with applicable regulatory and trade standards specified.

1. Provide hardware templates to door and frame manufacturer. Provide two templates to those manufacturers who are not currently registered template book holders.
2. Provide finish hardware schedule for use by the door and frame suppliers.
3. Where hardware sets/groups have different information than the specifications, refer to the specifications and drawings for clarification and bid combined hardware sets/groups and Contract Documents/specifications. Provide combined materials/devices at time of submittals in addition to other coordination items:
    a. Coordinate keying requirements as specified in this Section.

C. Convene coordination meeting between all opening vendors and installers at least two weeks prior to purchasing doors, frames, door hardware, and electrical devices required for complete systems.

1. Required attendance includes, but is not limited to, the following: Contractor, hardware supplier and/or installer, door supplier and/or installer, frame supplier and/or installer, security card reader vendor and/or installer, and electrical contractor.
2. Contractor shall be responsible for verifying that the door hardware accepted for installation is compatible for use with the doors and door-frames.
3. For card reader and interlock interface with applicable door devices, security vendor and/or installer (coordinate accordingly) shall have a written agenda and plan on how scope related to electrified devices will be installed to have a complete wired and operational card access system. The card reader interface scope includes, but is not limited to, card reader input and output coordination on the electric locking device power supply, electric locking devices and connectivity as well as confirmation of a complete, wired, and operational card access system. Provide all required relays and devices as part of the overall system in accordance with system requirements at no additional cost.

1.5 SUBMITTALS

A. General:

1. Submit in accordance with Division 01.

B. Pre-Hardware Schedule:

1. Report all prevailing conditions that will adversely affect satisfactory execution of work. Examine existing doors and/or frames scheduled for hardware replacement.

C. Submit a detailed door and hardware schedule according to the following:

1. Hardware Schedule:

a. Submit hard copies as required by Division 01, as well as editable / searchable electronic PDF via email electronic ftp site in vertical format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Schedules which do not comply will be returned for correction before checking. Horizontal-type schedules will be returned for correction before checking.

b. Shop drawings / hardware schedule shall clearly indicate each hardware group specified and manufacturer of each item proposed.

c. Shop drawings must be submitted for those items furnished and installed under this Contract.

d. Indicate materials, fabrication, finishes, dimensions, tolerances, quantities, locations, and other items required to describe the Work of this Section.

e. Indicate anchor, erection and elevations at not less than 1/2 inch to 1’-0” scale and details at not less than three inches to 1’-0” scale. Show anchorage and accessory items, dimensions and finishes.

f. Indicate embedded or surface applied steel frames or shapes necessary for the installation of this work. Show type and spacing of anchorage for these items. Indicate permissible tolerances for each type. Indicate type, size and spacing of field welding required for each item.

2. Provide two copies of illustrations from manufacturer’s catalogs and data in brochure form. Submit editable / searchable electronic PDF copies of illustrations from manufacturer’s catalogs and data in brochure form via email electronic ftp site.

3. Wiring Information: Provide manufacturers’ wiring information including manufacturers’ door elevation diagrams for electrified hardware based on Door Hardware Institute (DHI) core class “Electrified Architectural Hardware” DHI class #COR133. Openings where only magnetic hold-opens or door position switches are specified do not require wiring information. Provide information with hardware schedule submittal for review. Provide detailed wiring diagrams with hardware delivery to jobsite.

4. Review of schedules does not relieve the Contractor of providing all hardware required for the Work, whether or not such hardware was inadvertently omitted from Submittal.

D. Templates:

1. Provide listing of manufacturer's template numbers for each item of hardware in hardware schedule.

2. Submit templates and "Reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.

E. Notice of Discrepancy: Within twenty days of Notice to Proceed, submit notification that quantities of hardware items indicated to be furnished by hardware contractor are of the correct type and quantity required to complete the Work of this Section. If type and quantity are not correct, indicate variations.

F. Independent Testing Laboratory Reports:

1. Submit results of anchor bolt pull-out test.

G. Certificates:
   1. Submit manufacturer's certificate that products meet or exceed specified requirements.
   2. Submit evidence of AWS certification for shop and field welders.
   3. Submit testing reports for compliance with ASTM F1577.

H. Submit documentation indicating qualifications of Detention Equipment Specialist conform to specified requirements.
   1. Include list of references who can verify experience for each listed project, as follows:
      a. Project name.
      b. Number of celled units.
      c. Date of services.
      d. Name of owner, and current telephone number.
      e. Name of contractor, and current telephone number.
   2. For each listed project, indicate types of doors and hardware used; include manufacturers and model numbers.

I. Detention Equipment Specialist's Activity Log: Submit current copy at the end of each two week period during product installation.

J. Manufacturer's Quality Assurance Program:
   1. Upon request, the Manufacturer must submit a copy of manufacturer's current Quality Control Procedures.

K. Installation Instructions:
   1. Provide manufacturer's written installation and adjustment instructions for finish hardware.
   2. Send installation instructions to site with hardware.

L. Single Manufacturers for Manufacturer's Devices:
   1. Obtain each type of hardware from single manufacturer, although several may be indicated as offering products complying with requirements.

M. Contract Closeout Submittals: Include specific requirements indicated below:
   1. Operating and maintenance manuals: Submit three sets containing the following:
      a. Complete information in care, maintenance, and adjustment, data on repair and replacement parts, and information on preservation of finishes.
      b. Catalog pages for each product.
      c. Name, address, and phone number of local representative for each manufacturer.
      d. Parts list for each product.
      e. Copy of final accepted hardware schedule, edited to reflect "As installed".
      f. Copy of final keying schedule.

N. Warranties: Sample of special warranties.

1.6 QUALIFICATIONS

A. Detention equipment suppliers not listed shall be pre-qualified by Owner and provide the following information:

1. List the last five jobs completed along with Owner's and Contractor's names.
2. Show proof of completed schedule on past jobs.

B. Detention Equipment Specialist (DES):

1. Minimum five years' experience in the application and installation of security doors and related hardware.
2. Having completed five projects of at least 200 celled units and one project of 800 celled units, all in satisfactory operation for at least one year.
3. Submit documentation from the approved Detention Equipment manufacturer on this project stating that the subcontractor and DES is a certified factory trained, fully authorized installer of their product specified for this section which includes sliding devices, locks and required detention accessories.

1.7 FIELD SAMPLE

A. Provide field sample in accordance with Division 01.

B. Hardware:

1. Provide, as a field sample, hardware for field samples required in accordance with Division 01 and Division 11.
2. Production of materials or assemblies must not commence until approval of the field sample is received from Owner.

C. Welds:

1. Provide sample weld, ground smooth, filled and prepared for final finish of each type of weld.
2. Upon approval by Owner, weld must constitute a standard of acceptability for welds of that type.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Packaging:

1. Final assemblies must be wrapped in protective material or crated so as to provide adequate protection during shipment.
2. Units must be appropriately marked with plan door numbers, size handling and hardware type.

B. Receive items indicated on Drawings to be furnished by hardware contractor, from the hardware contractor.

1. Inspect all components for damage upon receipt and notify hardware contractor of any damaged items. Hardware contractor is responsible for removing and replacing damaged items.
2. Provide itemized receipt to hardware contractor, with an indication that all items have been received in an undamaged condition.

1.9 SEQUENCING, SCHEDULING, AND COORDINATION

A. Coordinate the Work of this Section with other Sections affecting or affected by the Work of this Section.

B. Advise electrical, electronic systems and mechanical subcontractors regarding standard and special installation requirements to ensure full and proper operation of equipment.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer, Installer, and Contractor jointly and severally agree to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including excessive deflection, cracking, or breakage.
      b. Faulty operation of operators and detention door hardware.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering or detention use.
   2. The warranty must be signed by officers of each company.
   3. Warranty Period: One year from date of Project completion.
   4. Warranty Period for Continuous-Pin Detention Hinges: Ten years from date of Project completion.
   5. Warranty Period for Security Door Closers: Five years from date of Project completion.

1.11 MAINTENANCE MATERIALS

A. Furnish, for institution use only, four complete sets of:
   1. Special tools required for locking device and hardware maintenance.
   2. Lock repair kits.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cold Rolled Low Carbon Steel Sheet: ASTM A1008.

B. Hot Rolled Low Carbon Steel Sheet: ASTM A568 and ASTM A1011, pickled and oiled.

C. Plates and Bars: ASTM A29 or A283, Grade C.

D. Steel Sections, Plates, Not Otherwise Indicated: ASTM A36.

E. Stainless Steel: ASTM A240, Type 304, Austenitic.

F. Galvanized Carbon Steel Sheets: ASTM A924 with ASTM A653 G90 Coating.

G. Primer: USP/BHMA 600.

2.2 FINISHES

A. Unless otherwise specified, finishes shall be as follows:
   1. BHMA 626 – Satin chromium plated brass or bronze.
   2. BHMA 628 – Satin or dull aluminum, clear anodized (uncoated).
   3. BHMA 630 – Satin stainless steel.
   4. BHMA 652 – Satin or dull chromium plated steel.
   5. BHMA 689 – Sprayed aluminum paint finish.

2.3 RECYCLED CONTENT

A. Provide products with at least the following content:
   1. Hinges: 35 or more percent pre-consumer recycled content.
   2. Locks: 50 or more percent post-consumer recycled content.
   3. Closers: 50 or more percent post-consumer recycled content.
   4. Kick Plates: 35 or more percent pre-consumer recycled content.

2.4 FIRE RATED DOORS

A. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device. Provide all specifications even if not written in hardware sets/groups.

B. Provide all hardware necessary to meet the requirements of CBC for fire doors and exit doors, as well as to other requirements specified, even if such hardware is not specifically mentioned under Article “Hardware Schedule” of this Section.

2.5 SCREWS, BOLTS, AND FASTENING DEVICES

A. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices with detailed requirements for each type of device

B. Fasteners
   1. General: Operable only by tools produced for use on specific type of fastener by fastener manufacturer or other licensed fabricator. Drive-system type, head style, material, and protective coating as required for assembly, installation, and strength, and as follows:
   2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Holo-Krome; a Danaher corporation.
      b. Safety Socket LLC.
      c. Tamper-Pruf Screws.
      d. Textron Fastening Systems; Textron Inc.

3. Fasteners not otherwise described herein must be security type in accordance with Section 11 98 16, requiring special tools to install and remove.
    a. Exposed Screws, Bolts, and Nuts: Meet ASTM A307 Grade A; in accordance with Section 11 98 16 and approved shop drawings.
    b. Screw thread adhesive sealant: Provide and install with Loctite No. 271 A; in accordance with approved shop drawings.
    c. Drive-System Types: Pinned Torx-Plus.
    d. Fastener Strength: 120,000 psi.
    e. Socket Button Head Fasteners:
        1) Heat-treated alloy steel, ASTM F835/F835M.
        2) Stainless steel, ASTM F879/F879M, Group 1 CW.
    f. Socket Flat Countersunk Head Fasteners:
        1) Heat-treated alloy steel, ASTM F835/F835M.
        2) Stainless steel, ASTM F879/F879M, Group 1 CW.
    g. Socket Head Cap Fasteners:
        1) Heat-treated alloy steel, ASTM A574/A574M.
        2) Stainless steel, ASTM F837/F 837M, Group 1 CW.
    h. Protective Coatings for Heat-Treated Alloy Steel:
        1) Zinc and clear trivalent chromium where indicated.
        2) Zinc phosphate with oil, ASTM F1137, Grade I, or black oxide unless otherwise indicated.
    i. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.
    j. Threshold anchors: Flat Sleeve Anchors (Pemko example FHSL 25 1/4 - 20 2 inch) cadmium plated expansion anchor screw in one unit.

2.6 SUBSTITUTIONS

A. Products referenced by specific brand names and model numbers have been identified by Owner to match other products in use either completed or in the course of completion. No substitutions permitted per Public Contract Code Section 3400.
    1. Otherwise refer to Division 01 for substitutions.

2.7 COMBINE SPECIFICATIONS AND HARDWARE GROUPS/SETS IN SECTION 11 98 14, PART 3

A. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device. Provide all products and services in specifications even if not written in hardware groups/sets in Part 3.

2.8 HANGING HARDWARE

A. Butt Hinges:

1. Where hardware groups/sets have different information (number of hinges and sizing), refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device.
    a. Furnish and install Southern Steel - Cast Institutional Mortise Hinge as scheduled.
    b. Furnish and install “weight/strength” as specified in hardware groups/sets in Part 3 (hinge nomenclature basis-of-design weight/strength).
    c. Furnish and install two butts for doors up to 60 inches high and one additional butt for each 30 inches of height or fraction thereof. Furnish three butts for doors up to 36 inches wide. Furnish four butts for doors over 42 inches wide.
    d. Electric Hinges: Provide electrified hinges with certified UL Listed, concealed wires. Provide electric hinges with standardized wire colors to accommodate up to 12 wires (4, 6, 8 or 12 as required per to provide sufficient number of concealed wires to accommodate electric function of specified hardware). If additional wires are specified (more than needed for electrified devices), provide the wires specified.
    e. Products by the following manufacturers will be considered for acceptance providing all specified criteria have been met in full. Furnish all items and components of hardware required to complete the work in accordance with specifications, Contract Documents, and intended operation.
        1) RR Brink Systems.

2.9 SECURING DEVICES (LATCHING SYSTEMS)

A. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device.

B. Security Hardware Products:

1. Locks:
    a. Southern Steel.
        1) Model as shown in schedule.
        2) Provide additional specification scope specified in this Section.
    b. Products by the following manufacturers will be considered for acceptance providing all specified criteria have been met in full. Furnish all items and components of hardware required to complete the work in accordance with specifications, Contract Documents, and intended operation.
        1) RR Brink Systems.

C. Electro Bolt Lock for swinging doors:

1. Appearance: System shall have a normal appearance when installed so that there are no cover boxes over the doors, no visible locking pilasters for mechanisms above or beside door jambs, and no special "lock pockets" or embedded items around door frames for housing mechanisms, keyed locks or releases. Door shall have lock knobs and hinges as specified, be contained in a normal-appearing mechanism and shall be concealed when door is closed.
2. Electric Operation:
    a. Under electric operation, it shall be possible to:
        1) Unlock the door by means of a push button switch located on the control panel. After being electrically unlocked, door shall automatically relock and deadlock when moved to the closed position.
    b. In case of electrical failure, the lock shall fail in the locked position (secure).
    c. Detail drawings of panel arrangement showing location of indicator lights, electric switches, manual release, and other controls for each door are shown on Drawings and specified in Division 28.
    d. Electrical Requirements:
        1) Lock supplier to verify and/or coordinate electrical requirements.
        2) All electrical locks are to carry a UL label.
3. Contractor Responsibilities:
    a. Detention Equipment Contractor shall provide and coordinate all doors, door frames, detention hardware, manual controls and factory-wired electrical units for each door and factory-wired door control panel, including relays, switches and indicator lamps. Detention Equipment Contractor shall also provide necessary raceways for manual controls from control panel to each swinging door operated therefrom.
    b. Electrical Contractor shall furnish, install and connect to factory-wired terminal blocks all wiring from sources of supply to control panels and wires from control panels to electrical unit at each door. This shall include conduits and all other electrical units at each door, as well as conduits and other electrical equipment incident to power supply.
    c. Electrical Requirements:
        1) Locks to require 24 VDC low voltage power.
        2) All electrical locks are to carry a UL label.
4. Contractor Responsibilities:
    a. Detention Equipment Contractor shall provide and coordinate all doors, door frames, detention hardware, manual controls and factory-wired electrical units for each door and factory-wired door control panel, including relays, switches, and indicator lamps. Detention Equipment Contractor shall also provide necessary raceways for manual controls from control panel to each swinging door operated therefrom.
    b. Electrical Contractor shall furnish, install, and connect to factory-wired Molex connectors pigtails all wiring from sources of supply to control panels and wires from control panels to electrical unit at each door. This shall include conduits and all other electrical units at each door, as well as conduits and other electrical equipment incidental to lock operation and monitoring of door position if required.

2.10 KEY SYSTEMS (CYLINDERS, CORES, AND KEYS)

A. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device. Keying specifications below override hardware set/group nomenclature.

B. Key Systems (Cylinders, Cores, and Keys):

1. For all locking or dogging devices, provide complete keying system whether or not specified in Section 11 98 14, Part 3 hardware sets including lock cores, mortise cylinders, and rim cylinders keyed as directed by Owner in submittal process. Key System shall be:

a. Southern Steel or RR Brink Systems.

1) Manufacturer's standard pin-tumbler type, minimum 2-inch (50-mm) diameter; body constructed from brass or bronze, stainless steel, or nickel silver; with stainless-steel tumblers and engaging cylinder balls:

2) Provide High-Security Grade: Listed and labeled as complying with pick- and drill-resistant testing requirements in UL 437 (Suffix A).

3) Number of Pins: Six.

4) Provide Mortise Type: Rim or Mortise type with blocking rings and quantity as required by locking device.

5) Finish: BHMA 626. x appropriate cam.

6) Fabricate keys out of heat treated alloy bronze having a tensile strength of not less than 90,000 pounds and a hardness of the Brinnel scale of at least 170.

7) Keyway: Provide as instructed by Owner during submittal process.

C. Keying Requirements:

1. Provide keyed, construction cylinders and keys during the construction period.

a. Provide brass construction cylinders and brass keys at all doors.

b. Plastic cores are not permitted.

c. Construction cylinders shall not be part of the Owner's permanent keying system or furnished in the same keyway or key section as the Owner’s permanent keying system. Permanent cylinders and keys prepared according to the accepted keying schedule shall be furnished to the Owner.

2. Keying Meeting and Programming Schedule:

a. After detention hardware, doors and frames has been submitted and reviewed in accordance with Division 01 requirements and Section 11 98 14, arrange a keying matrix/programming meeting with Owner and hardware supplier/Vendor representing the Southern Steel or RR Brink Systems system for a minimum of two meetings and a minimum of eight weeks prior to keying operations.

1) Copies of the reviewed door and frame submittals shall be brought to the meeting with card reader and keyed doors highlighted for review.

2) Follow procedures for keying meeting and programming schedule as outlined by the Door Hardware Institute. DHI procedures are based on example Door Hardware Institute core class entitled Masterkeying class #AHC200.

b. Keying meeting to produce a programming schedule/matrix based on the following:
   1) Furnish keys in the following quantities (total quantity of keys part of bid package):
      a) 5 each Grand master mogul keys per set.
      b) 6 each Master mogul keys per set.
      c) 10 each Change or Day mogul keys each lock, core or cylinder.
      d) 20 each Construction master mogul keys during construction.
      e) Stamp each key with number or letter as directed by Owner.
   2) Provide keying system expansion parameters.
      a) Plan twenty changes directly under the grand.
      b) Plan ten master keys.
      c) Plan fifty changes each for each master
   3) Permanent keys and cores shall be stamped with the applicable key mark for identification. The visual key control marks or codes shall not include the actual key cuts.
   4) Permanent keys shall be stamped "Do Not Duplicate".
c. Furnish meeting notes and three compete, typed copies of keying and programming schedule to Owner for final review. Submit editable / searchable electronic PDF copies of keying and programming schedule form via email electronic ftp site.
d. Furnish keying and programming schedule to Schlage manufacturing factory for production of cores, cylinders and other keyed devices.

3. Transmit cores/cylinders as well as grand masterkeys, masterkeys, change keys and other security keys to Owner by Registered Mail, return receipt requested.
4. Install permanent cores in presence of Owner. Installation of permanent cylinders and/or cores in permanent locking or cylinder housings shall occur after substantial completion and prior to final completion.

D. Fire Extinguisher Cabinets:
   1. At all fire extinguisher cabinets, furnish and install the following lock: 1010AM or as required with the door manufacturer's requirements. Coordinate with fire extinguisher shop drawings before ordering devices.

   2. Furnish all devices and components for hardware groups/set above in accordance with Contract Documents including, but not limited to, additional hardware devices requirements in the above specification language, architectural plans and full specification documents.

E. Fire Control Key Boxes:
   1. Product: Rapid Entry System.
   2. Manufacturer and Product: Basis-of-Design: Knox Box 3200 Series x The Knox Co.
   3. Recessed mount, UL-listed, heavy-duty unit; fabricate from 1/4-inch-thick steel plate.
   4. Provide with restricted keying as required by Local Fire Department.

5. Provide one box at each main entry from each parking area designated with a fire emergency lane.
6. Provide tamper alarm switch with each box.
7. Provide outlet boxes, conduit, wiring, and connections as specified in appropriate Division 26-28 Sections.

2.11 CONCEALED AND SURFACE MOUNTED CLOSERS

A. LCN.
   1. Model #2215DPS or as shown in schedule.
   2. Provide additional specification scope in above and below Section 11 98 14.

B. Subject to conformance with requirements, alternative products or manufacturers are acceptable. Furnish all items and components of hardware required to complete the work in accordance with specifications, Contract Documents, and intended operation.

C. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device:
   1. Grade 1; UL Listed; meets UL 10C and SFM Standard 12-7-4 for positive pressure fire test.
   2. Closers shall have multi-size spring power adjustment to permit setting of spring from 1 through 6 with additional spring power available. Provide ADA compliant setting nomenclature during submittals as recommended by closer manufacturer.
   3. Submit correct closer type as to be able to install closers on non–public side of doors (examples include but are not limited to 1) interior side of storage/electrical type rooms; 2) not in corridors/public areas, and at exterior locations, install closers inside of building (in conditioned spaces)
   4. Installation Plates, Brackets, and Miscellaneous Adapters:
      a. Provide drop plates, brackets, or adapters for arms as required to suit details and install as directed by manufacturer’s templates.

2.12 STOPS AND HOLDERS

A. Floor and Wall Door Stops/Holders and Bumpers:
   1. Acceptable Manufacturers:
      a. Southern Steel Door Stop.
   2. Products by the following manufacturers will be considered for acceptance providing all specified criteria have been met in full. Furnish all items and components of hardware required to complete the work in accordance with specifications, Contract Documents, and intended operation.
      a. RR Brink Systems.
   3. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device:
      a. Coordinate with Section 05 40 00 and Section 09 22 16 for required wall backing.

2.13 ACCESSORIES

A. Pulls:
   1. Raised Pull:
      a. Southern Steel Pull Handle.
   2. Products by the following manufacturers will be considered for acceptance providing all specified criteria have been met in full. Furnish all items and components of hardware required to complete the work in accordance with specifications, Contract Documents, and intended operation.
      a. RR Brink Systems.

B. Kick/Mop Plates:
   1. Acceptable Manufacturers:
      a. Ives Manufacturing.
      b. Triangle Brass Manufacturing Company, Inc. (Trimco).
      c. Rockwood.
      d. Hager Manufacturing.
   2. Size at single doors:
      a. Push side of door two inch less than door width. Hardware set/group nomenclature: 2 inches LDW.
      b. Pull side and one inch less than door width. Hardware set/group nomenclature: 1 inch LDW.
   3. At pairs of doors, width shall be one inch less than door width on both sides.
   4. Height shall be 10 inches, unless otherwise indicated.

C. Smoke Seals, Sound Seals, and/or Weatherstripping.
   1. Acceptable Manufacturers:
      a. Pemko Manufacturing, Inc.
      b. National Guard.
      c. Zero International.
   2. Automatic door bottom with 1/2 inch to 1 inch drop; vinyl drop seal.
      a. Factory installed where indicated.

D. Door Bottoms, and Thresholds:
   1. Acceptable Manufacturers:
      a. Pemko Manufacturing, Inc.
      b. National Guard.
      c. Zero International.
   2. Thresholds shall comply with CBC Sections 1010.1.6 and 11B-404.2.5 and shall not exceed 1/2 inch in height.

E. Rubber Door Silencers:

1. Provide rubber door silencer for each door opening in detention metal frame assemblies that are to be provided with a swing-type door.
2. Three required for each opening where swing-type door is to be installed and four required for each opening where pair of swing-type doors are to be installed.

F. Drip Guard:

1. Provide at exterior doors exposed to rain per architectural details and flashing, or by door manufacturer to meet no water penetration warranties. For hollow metal doors, provide 346C x FFW full raindrips by Pemko or approved equal.
2. Size: Full Frame Width (FFW).
3. Provide devices painted to match adjacent frame. See Section 09 91 00 for paint and primer requirements.

2.14 POWER SUPPLIES, ELECTRIFIED HARDWARE, AND WIRES

A. Door Position Switches:

1. Where hardware groups/sets have different information, refer to the following specifications for clarification and submit according to complete and intended electrified system per Contract Documents. See Architectural and Security drawings and specifications.
   a. Southern Steel Door Position Switch.
   b. Door Position Switch/Closer (DPS): LCN 2215 DPS.
   c. Coordinate door and frame preparations with door and frame suppliers.

B. Power Supplies, Wires, and Relays:

1. Where hardware groups/sets have different information (number of hinge wires and power supply information), refer to the following specifications for clarification and submit according to complete and intended electrified system per Contract Documents. See Architectural and Security drawings and specifications.
   a. Coordinate use of power supplies with door and frame locations. Provide power supplies, relay, and battery backup units as part of the overall system in accordance with the manufacturer's warranty and system requirements. UL listed for applicable use; housed in an approved enclosure; and provide both Class 1 and Class 2 outputs.
   b. Output shall be filtered and regulated. Relay, timer, and logic modules shall be provided as required for interface to indicated security components, and shall be assembled, connected, and fully contained within the power supply enclosure.
   c. Provide required connections to accommodate fire alarm/life safety system and/or security electronics for remote site monitoring of all electrified components and functions.

2.15 FABRICATION

A. Factory assemble items where practicable, true to line and free of distortion or defects.

B. Welding:

1. Steel and stainless steel components not plant fabricated must be designed for field-welded connections.
2. Plug or stitch welds unless otherwise indicated.
3. Weld according to American Welding Society standards.
4. Fill exposed joints with metallic filler, grind smooth.
5. Remove burrs and rough edges.

C. Equipment must be fully fabricated, assembled and finished, ready for final installation.

D. Hardware:

1. Hardware that is essentially non-projecting must be installed in doors and frames, at the factory, including the following:
   a. Mechanical locks and their associated strikes, keepers and escutcheons.
   b. Hinges, either screwed or welded, must be fastened to doors.
   c. Flush pulls.
2. Other hardware must be field installed; including closers, position indicators, pulls, cylinder shields, door hangers and guides, door bottoms and weather protection, projecting angle clips for cell door boots.
3. The field installed hardware group for each opening must be separately packaged, accompanying the doors and clearly identified with its opening.

2.16 CLEANING AND FINISHING

A. Galvanizing:

1. Iron and Steel Hardware: ASTM A153.
2. Shapes, Bars, Plates 1/8 inch or Greater Thickness: ASTM A123.
3. Galvanized items must be G90 galvanized unless otherwise indicated.
4. Galvanize exterior lock cases.

B. Factory apply an additional coat of aluminum paint to unexposed surfaces of cover panels, cover boxes, control cabinets and door locking or operating parts.

2.17 EXTRA STOCK/SPARE PARTS

A. Provide spare parts for each type of hardware listed in the hardware schedule as follows:

1. Provide two each type 9724 x K2 x KCE x RLHB, 24 VDC (one right hand and one left hand).

B. The Detention Equipment Contractor is responsible for making a full accounting of all hardware extra stock.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions are suitable for installation of the Work of this Section.

B. Allow hardware contractor to inspect existing conditions during and prior to beginning of installation of items being furnished by hardware contractor.

C. Examine areas, substrates, anchors, and grounds to receive detention equipment.

D. Verify rough in and verify field dimensions.

E. Do not begin installation until unsatisfactory conditions have been corrected. Beginning installation means acceptance of existing conditions.

3.2 INSTALLATION PREPARATION

A. Inspection:

1. Examine and inspect all surfaces, anchors and grounds that are to receive material, fixtures, assemblies and equipment specified herein. Report all unsatisfactory conditions.
2. Check location, "roughing-in" and field dimensions prior to beginning work.
3. Do not begin installation until all unsatisfactory conditions have been corrected.
4. Proceeding with installation will be construed as evidence of acceptance of conditions under which work will be done.

B. Protecting:

1. Protect installed Work from damage or soiling.
2. Installer shall advise Contractor of required procedures for surveillance and protection of completed work. Advice shall extend through period of installation of other work near detention equipment work, and also through remainder of construction period for the purpose of ensuring that detention equipment will not be damaged.

3.3 INSTALLATION

A. Install Work in accordance with manufacturer's instructions and shop drawings under the direction of a Detention Equipment Specialist. Detention Equipment Specialist must:

1. Observe and direct the installation, adjustment, and operation of the Work of this Section.
2. Keep a complete log of activities on the job. Include dates, time, instructions given and to whom, potential problems and other pertinent information relating to installation and proper operation of the Work of this Section.
3. Participate in final inspections of the work.

B. Install products furnished by hardware contractor; coordinate to permit observation as required by the detention equipment specialist.

C. Install locks, pulls, closers and other hardware not factory installed in doors and frames.

D. Hardware Placement:
   1. Hinges: Door and frame manufacturer's standard or existing location scope per additional specifications and plans.
   2. Door Pulls / Push Plates (centerline): Mounted / centered 42 inches above finished floor or ground.

E. Members must be welded to embeds as indicated on reviewed shop drawings. Post-installed anchors must be used only as specifically shown and approved by the Owner's Representative.

F. Bolts, screws and other fastenings in devices, hardware, and other items must be tightened to the torque specification as indicated in the manufacturer installation instructions and in accordance with the approved shop drawings.

G. Grind Smooth: Sharp edges, burrs, or projecting materials on detention equipment, steel framing and welds.

H. Fasteners: Set removable fasteners in Loctite.

I. Welding:
   1. Stitch Welds: Minimum 3 inches long, 12 inches on center.
   2. Plug Welds: 1/2 inch diameter, 4 inches on center unless otherwise indicated.
   3. Hinges and members 6 x 6 inches, or less, must be continuously welded except as follows:
      a. Model 205 and Model 203 butts used on hollow metal doors must be screwed to the doors and welded to the frames.
   4. Materials forming corners must be welded along each line of transition at the corner.
   5. Where exposed to view, fill between welds with security sealant under provisions of Section 07 92 00, grind and finish smooth.
   6. Welds must be smooth with no sharp points or edges.
   7. Tack weld exposed bolts in areas where inmates have access.
   8. Contractor's Option:
      a. Where welds not specifically indicated, either stitch or plug welds may be used.
      b. Contractor may request optional welds.
      c. Where stitch welding is allowed in lieu of spot welds, repair so as to conceal prepared areas.

J. Ship prepaid to door/frame manufacturer for factory installation the detention equipment hardware required for all types of detention equipment prison metal frame assemblies; deliver all other detention equipment hardware products to project site.

K. Butts and Hinges: Attach hinges to doors and door frames with specified countersunk flat security-head stainless steel metal screws.

3.4 FIELD QUALITY CONTROL FIELD TESTING AND ADJUSTMENT

A. Detention equipment hardware manufacturer's representative is to inspect and approve work, in writing, after installation.

B. All door locks, door position switches, limit switches, keyswitches, and lock feature switches installed by the Detention Equipment Installer must be in perfect operating order prior to the Door Control System Installer's System Test and Final Acceptance Test.

3.5 PRIME COAT TOUCH-UP AND CLEANING

A. Weld spatter must be cleaned from equipment and from adjacent surfaces. Where finished adjacent surfaces are damaged by welding, restore those surfaces to their previous condition.

B. Prime joint sealers and welds and touch-up abraded areas of work under this Section with specified primer, leaving the work ready for finish painting.

C. Finish painting is specified under Section 09 91 00.

3.6 DETENTION DOOR HARDWARE SCHEDULE:

A. Manufacturers Legend:

Code	Name
SS	Southern Steel Manufacturing
LC	LCN Manufacturing
TR	Trimco Manufacturing
IV	Ives Manufacturing
PE	Pemko Manufacturing

B. Hardware Columns - Example (Legend):

Qty	Device Description	Device # (include specification language)	Finish	Manu
1	- - - - - - - - - - - -	- - - - - - - - - - - -	- -	- -

C. The following hardware sets are intended to establish type and standard of quality when used together with the requirements of this Section. See above Section and related Sections including Division 01.

1. Examine Contract Documents and furnish proper hardware for door openings.
2. Refer to Door Schedule on the Drawings for Hardware Group/Set assignments for each opening.
3. Refer to Door Schedule on the Drawings for Hardware Group/Set assignments for each opening.

Hardware Group/Set #DH1

4	Ea.	Hinges	204FMSS x security torx fasteners	630	SS
1	Ea.	In-Frame Double Keyed, Fire-Rated Electrified Locking / Latching Device	10120AMD x K2 x KCE x 24 VDC Power	630	SS
2	Ea.	Cylinder	Per Section 11 98 14	626	SS
2	Ea.	Raised Pull	212C	626	SS
1	Ea.	Closer x Door Position Switch	LCN 2215DPS x security torx fasteners per specifications. Coordinate door and frame preparation/templates and Divisions 26-28 with applicable Security drawings	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	420	630	SS
1	Ea.	Seal (weatherstripping)	S88D with Perforation Feature (head and jambs)		PE
1	Ea.	Door Bottom Sweep	210APK x security torx fasteners per specifications		PE
1	Ea.	Threshold	2727A or 176A or per detail (sized to fit the condition) x security torx fasteners		PE
1	Ea.	Overhead Rain Drip	Per architectural details and flashing at uncovered areas (or by door manufacturer to meet no water penetration warranties – verify before submittals). For hollow metal doors, provide 346C x FFW full raindrips by Pemko or approved equal.		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 11 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required. Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include access control locations.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages

Hardware Group/Set #DH2

4	Ea.	Hinges	204FMSS x security torx fasteners	630	SS
1	Ea.	In-Frame Double Keyed, Fire-Rated Electrified Locking / Latching Device	10120AMD x K2 x KCE x 24 VDC Power	630	SS
2	Ea.	Cylinder	Per Section 11 98 14	626	SS
2	Ea.	Raised Pull	212C	626	SS
1	Ea.	Closer x Door Position Switch	LCN 2215DPS x security torx fasteners per specifications. Coordinate door and frame preparation/templates and Divisions 26-28 with applicable Security drawings	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	420	630	SS
1	Ea.	Seal	S88D with Perforation Feature (head and jambs)		PE
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 11 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required. Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include access control locations.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages

Hardware Group/Set #DH3

4	Ea.	Hinges	204FMSS x security torx fasteners	630	SS
1	Ea.	In-Frame Double Keyed, Fire-Rated Electrified Locking / Latching Device	10120AMD x K2 x KCE x 24 VDC Power	630	SS
2	Ea.	Cylinder	Per Section 11 98 14	626	SS
2	Ea.	Raised Pull	212C	626	SS
1	Ea.	Closer x Door Position Switch	LCN 2215DPS x security torx fasteners per specifications. Coordinate door and frame preparation/templates and Divisions 26-28 with applicable Security drawings	689	LC
1	Ea.	Door Stop	420	630	SS
1	Ea.	Seal (weatherstripping)	S88D with Perforation Feature (head and jambs)		PE
2	Ea.	Overhead Rain Drip	Per architectural details and flashing at uncovered areas (or by door manufacturer to meet no water penetration warranties – verify before submittals). For hollow metal doors, provide 346C x FFW full raindrips by Pemko or approved equal.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages

Hardware Group/Set #DH4

4	Ea.	Hinges	204FMSS x security torx fasteners	630	SS
1	Ea.	In-Frame Double Keyed, Fire-Rated Electrified Locking / Latching Device	10120AMD x K2 x KCE x 24 VDC Power	630	SS
2	Ea.	Cylinder	Per Section 11 98 14	626	SS
1	Ea.	Raised Pull	212C	626	SS
1	Ea.	Recessed/Flush Pull	214S	626	SS
1	Ea.	Closer x Door Position Switch	LCN 2215DPS x security torx fasteners per specifications. Coordinate door and frame preparation/templates and Divisions 26-28 with applicable Security drawings	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	420	630	SS
1	Ea.	Seal (weatherstripping)	S88D with Perforation Feature (head and jambs)		PE
1	Ea.	Door Bottom Sweep	210APK x security torx fasteners per specifications		PE
1	Ea.	Threshold	2727A or 176A or per detail (sized to fit the condition) x security torx fasteners		PE
1	Ea.	Overhead Rain Drip	Per architectural details and flashing at uncovered areas (or by door manufacturer to meet no water penetration warranties – verify before submittals). For hollow metal doors, provide 346C x FFW full raindrips by Pemko or approved equal.		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 11 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required. Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include access control locations.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

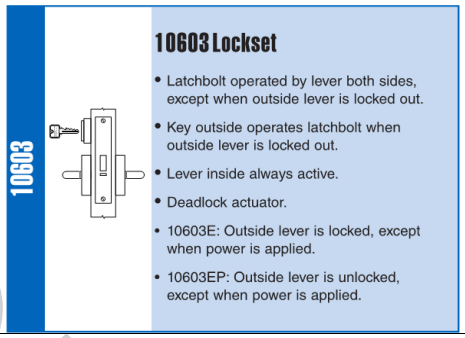
Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages

Hardware Group/Set #DH5

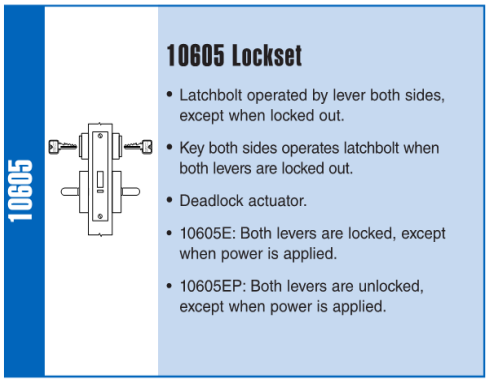
4	Ea.	Hinges	204FMSS x security torx fasteners	630	SS
1	Ea.	In-Frame Double Keyed, Fire-Rated Electrified Locking / Latching Device	10120AMD x K2 x KCE x 24 VDC Power	630	SS
2	Ea.	Cylinder	Per Section 11 98 14	626	SS
1	Ea.	Raised Pull	212C	626	SS
1	Ea.	Recessed/Flush Pull	214S	626	SS
1	Ea.	Closer x Door Position Switch	LCN 2215DPS x security torx fasteners per specifications. Coordinate door and frame preparation/templates and Divisions 26-28 with applicable Security drawings	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	420	630	SS
1	Ea.	Seal (weatherstripping)	S88D with Perforation Feature (head and jambs)		PE
1	Ea.	Door Bottom Sweep	210APK x security torx fasteners per specifications		PE
1	Ea.	Threshold	2727A or 176A or per detail (sized to fit the condition) x security torx fasteners		PE
1	Ea.	Overhead Rain Drip	Per architectural details and flashing at uncovered areas (or by door manufacturer to meet no water penetration warranties – verify before submittals). For hollow metal doors, provide 346C x FFW full raindrips by Pemko or approved equal.		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 11 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required. Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include access control locations.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages

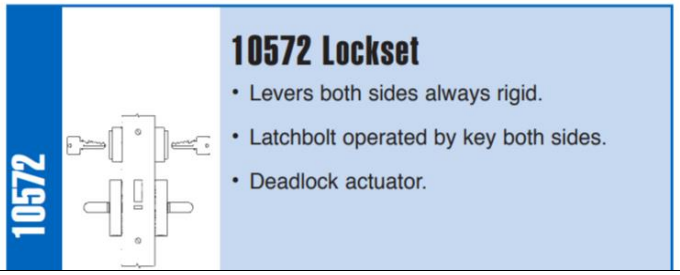
Hardware Group/Set #DH6

4	Ea.	Hinges	204FMSS x security torx fasteners	630	SS
1	Ea.	Auxiliary Electrified Through-Wire Hinge	204E x security torx fasteners. Note - not a load bearing hinge	626	SS
1	Ea.	Electrified Mortise Lockset	10603E 	630	SS
2	Ea.	Cylinder	Per Section 11 98 14	626	SS
2	Ea.	Raised Pull	212C	626	SS
1	Ea.	Closer x Door Position Switch	LCN 2215DPS x security torx fasteners per specifications. Coordinate door and frame preparation/templates and Divisions 26-28 with applicable Security drawings	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	420	630	SS
1	Ea.	Seal (weatherstripping)	S88D with Perforation Feature (head and jambs)		PE
1	Ea.	Door Bottom Sweep	210APK x security torx fasteners per specifications		PE
1	Ea.	Threshold	2727A or 176A or per detail (sized to fit the condition) x security torx fasteners		PE
1	Ea.	Overhead Rain Drip	Per architectural details and flashing at uncovered areas (or by door manufacturer to meet no water penetration warranties – verify before submittals). For hollow metal doors, provide 346C x FFW full raindrips by Pemko or approved equal.		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 11 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required. Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include access control locations.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #DH7

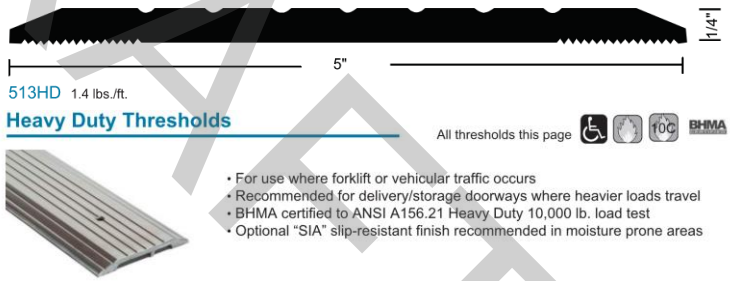
_	Ea.	Gate Hinge/Hanging Devices	Hanging device hardware by chain-link gate manufacturer – final to be selected		
1	Ea.	Auxiliary Electrified Through-Wire	TBS-C – final to be selected	630	SN
1	Ea.	Double Keyed Electrified Mortise Lockset	10605E 	630	SS
1	Ea.	Lockset Weldable Box	Keedex as required for locking device (contact Keedex for custom, Weldable Box for 10572 locking devices) Keedex Inc • 510 Cameron Street • Placentia, Ca • 92807 Phone (714) 993-4300 • Fax (714) 993-4303 Email- gates@keedex.com • Web- www.keedex.com		
2	Ea.	Cylinder	Per Section 11 98 14	626	SS
1	Ea.	Door Stop	420	630	SS
1	Ea.	Door Position Switch (also known as Alarm Contact, Door Contacts)	200MRS manufacturing (coordinate with Divisions 26-28 and applicable drawings).	630	SS
1	Ea.	Bottom of doors to be greater than 10” Clear, Unobstructed & Smooth Surface	Per above specifications and by gate manufacturer (push-side, ground smooth, primed, and painted to match gate).		
1	Ea.	Painted Full Height Astragal	Per above specifications and by gate manufacturer and per specifications (utilized as a positive stop – when gate closes against the astragals the opening cannot swing back in toward the egress side)		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 11 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required. Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include access control locations.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Hardware Group/Set #DH8

_	Ea.	Gate Hinge/Hanging Devices	Hanging device hardware by chain-link gate manufacturer		
1	Ea.	Double Keyed Mortise Lockset	10572 	630	SS
1	Ea.	Lockset Weldable Box	Keedex as required for locking device (contact Keedex for custom, Weldable Box for 10572 locking devices) 		
2	Ea.	Cylinder	Per Section 11 98 14	626	SS
1	Ea.	Door Stop	420	630	SS
1	Ea.	Bottom of doors to be greater than 10” Clear, Unobstructed & Smooth Surface	Per above specifications and by gate manufacturer (push-side, ground smooth, primed, and painted to match gate).		
1	Ea.	Painted Full Height Astragal	Per above specifications and by gate manufacturer and per specifications (utilized as a positive stop – when gate closes against the astragals the opening cannot swing back in toward the egress side)		
1	Ea.	Door Position Switch (also known as Alarm Contact, Door Contacts)	200MRS manufacturing (coordinate with Divisions 26-28 and applicable drawings).		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages

Hardware Group/Set #DH9

4	Ea.	Hinges	204FMSS x security torx fasteners	630	SS
1	Ea.	In-Frame Double Keyed, Electrified Locking / Latching Device	10120AMD x K2 x KCE x 24 VDC Power	630	SS
2	Ea.	Cylinder	Per Section 11 98 14	626	SS
1	Ea.	Raised Pull	212C	626	SS
1	Ea.	Recessed/Flush Pull	214S	626	SS
1	Ea.	Closer x Door Position Switch	LCN 2215DPS x security torx fasteners per specifications. Coordinate door and frame preparation/templates and Divisions 26-28 with applicable Security drawings	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	420	630	SS
1	Ea.	Seal	S88D with Perforation Feature (head and jambs)		PE
1	Ea.	Auto Door Bottom (sound dampening)	411APKL or 420APKL (as required per door material or wood or hollow metal) by Pemko or approved manufacturer.		
1	Ea.	Threshold	513HD x SIA 45-degree miter cut and closed ends per above 087110, welded returns to door/frame) x mastic x by NGP (meet ANSI 156.21 per below) 		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 11 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required. Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include access control locations.		

Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).

Hardware Group/Set #DH10

4	Ea.	Hinges	204FMSS x security torx fasteners	630	SS
1	Ea.	In-Frame Double Keyed, Electrified Locking / Latching Device	10120AMD x K2 x KCE x 24 VDC Power	630	SS
2	Ea.	Cylinder	Per Section 11 98 14	626	SS
1	Ea.	Raised Pull	212C	626	SS
1	Ea.	Recessed/Flush Pull	214S	626	SS
1	Ea.	Closer x Door Position Switch	LCN 2215DPS x security torx fasteners per specifications. Coordinate door and frame preparation/templates and Divisions 26-28 with applicable Security drawings	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	420	630	SS
1	Ea.	Seal	S88D with Perforation Feature (head and jambs)		PE
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 11 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required. Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include access control locations.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

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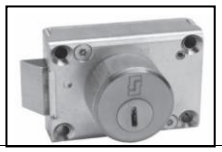
Hardware Group/Set #DH11

4	Ea.	Hinges	204FMSS x security torx fasteners	630	SS
1	Ea.	In-Frame Keyed Electrified Locking/ Latching Device	10120M-K1 x 24VDC	630	SS
1	Ea.	Cylinder	Per Section 11 98 14	626	SS
1	Ea.	Raised Pull	212C	626	SS
1	Ea.	Recessed/Flush Pull	214S	626	SS
1	Ea.	Food Pass/Cuff Port	Per architectural drawings		
1	Ea.	Deadlock (Food Pass/Cuff Port)	1017AM or as required with the door manufacturer's requirements (show in shop drawings) 	630	SS
2	Ea.	Cylinder	Per Section 11 98 14 (one for food pass lock)	626	SS
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	420	630	SS
1	Ea.	Seal	S88D with Perforation Feature (head and jambs)		PE
1	Ea.	Door Position Switch (also known as Alarm Contact, Door Contacts)	200MRS manufacturing (coordinate with Divisions 26-28 and applicable drawings).		SS
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 11 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required. Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include access control locations.		

Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).

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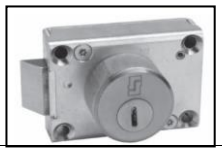
Hardware Group/Set #DH12

4	Ea.	Hinges	204FMSS x security torx fasteners	630	SS
1	Ea.	In-Frame Keyed Electrified Locking/ Latching Device	10120M-K1 x 24VDC	630	SS
1	Ea.	Cylinder	Per Section 11 98 14	626	SS
1	Ea.	Raised Pull	212C	626	SS
1	Ea.	Recessed/Flush Pull	214S (push-side – final to be selected)	626	SS
1	Ea.	Food Pass/Cuff Port	Per architectural drawings		
1	Ea.	Deadlock (Food Pass/Cuff Port)	1017AM or as required with the door manufacturer's requirements (show in shop drawings) 	630	SS
2	Ea.	Cylinder	Per Section 11 98 14 (one for food pass lock)	626	SS
1	Ea.	Closer x Door Position Switch	LCN 2215DPS x security torx fasteners per specifications. Coordinate door and frame preparation/templates and Divisions 26-28 with applicable Security drawings	689	LC
1	Ea.	Kick Plate (pull-side only)	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	420	630	SS
1	Ea.	Seal	S88D with Perforation Feature (head and jambs)		PE
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 11 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required. Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include access control locations.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

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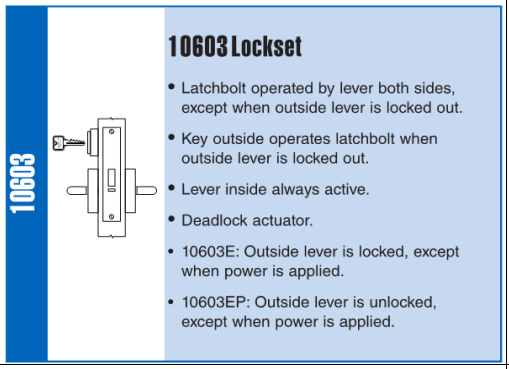
Hardware Group/Set #DH13

4	Ea.	Hinges	204FMSS x security torx fasteners	630	SS
1	Ea.	Auxiliary Electrified Through-Wire Hinge	204E x security torx fasteners. Note - not a load bearing hinge	626	SS
1	Ea.	Electrified Mortise Lockset	10603E 	630	SS
2	Ea.	Cylinder	Per Section 11 98 14	626	SS
1	Ea.	Closer x Door Position Switch	LCN 2215DPS x security torx fasteners per specifications. Coordinate door and frame preparation/templates and Divisions 26-28 with applicable Security drawings	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	420 (stop door at 90 degrees)	630	SS
1	Ea.	Seal	S88D with Perforation Feature (head and jambs)		PE
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 11 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required. Coordinate with security or electrical Divisions 26-28 and applicable drawings as hardware does not include access control locations.		
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

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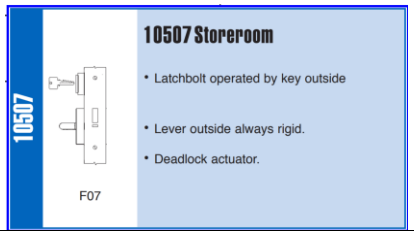
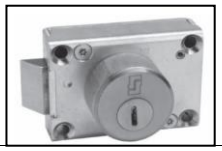
Hardware Group/Set #DH14

4	Ea.	Hinges	204FMSS x security torx fasteners	630	SS
1	Ea.	Mortise Lockset	10507 x door templated for no interior lever 	630	SS
1	Ea.	Food Pass/Cuff Port	Per architectural drawings		
1	Ea.	Deadlock (Food Pass/Cuff Port)	1017AM or as required with the door manufacturer's requirements (show in shop drawings) 	630	SS
2	Ea.	Cylinder	Per Section 11 98 14 (one for food pass lock)	626	SS
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	420	630	SS
1	Ea.	Seal	S88D with Perforation Feature (head and jambs)		PE
1	Ea.	Door Position Switch (also known as Alarm Contact, Door Contacts)	200MRS manufacturing (coordinate with Divisions 26-28 and applicable drawings).		SS
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

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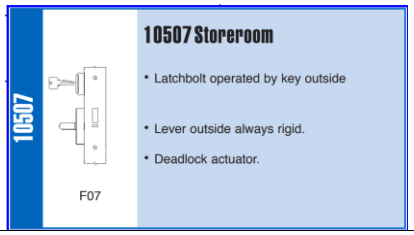
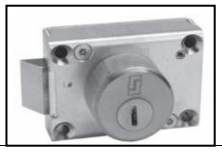
Hardware Group/Set #DH15

4	Ea.	Hinges	204FMSS x security torx fasteners	630	SS
1	Ea.	Mortise Lockset	10507 x door templated for no interior lever 	630	SS
1	Ea.	Food Pass/Cuff Port	Per architectural drawings		
1	Ea.	Deadlock (Food Pass/Cuff Port)	1017AM or as required with the door manufacturer's requirements (show in shop drawings) 	630	SS
2	Ea.	Cylinder	Per Section 11 98 14 (one for food pass lock)	626	SS
1	Ea.	Closer x Door Position Switch	LCN 2215DPS x security torx fasteners per specifications. Coordinate door and frame preparation/templates and Divisions 26-28 with applicable Security drawings	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	420	630	SS
1	Ea.	Seal	S88D with Perforation Feature (head and jambs)		PE
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

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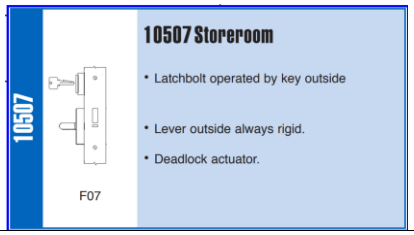
Hardware Group/Set #DH16

4	Ea.	Hinges	204FMSS x security torx fasteners	630	SS
1	Ea.	Mortise Lockset	10507 x door templated for no interior lever 	630	SS
1	Ea.	Recessed/Flush Pull	214S (at interior only)	626	SS
1	Ea.	Cylinder	Per Section 11 98 14	626	SS
1	Ea.	Closer x Door Position Switch	LCN 2215DPS x security torx fasteners per specifications. Coordinate door and frame preparation/templates and Divisions 26-28 with applicable Security drawings	689	LC
2	Ea.	Kick Plate	KO050 16" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	420	630	SS
1	Ea.	Seal	S88D with Perforation Feature (head and jambs)		PE
Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans and full specification documents).					

END OF SECTION

SECTION 11 98 15

DETENTION SECURITY GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Security glazing for detention hollow metal doors, windows and frames.

B. Glazing accessories.

1.2 RELATED SECTIONS

A. Section 08 56 19 – Transaction Windows.

B. Section 08 81 00 – Glass Glazing.

C. Section 08 88 13 – Fire Rated Glazing.

D. Section 11 98 00 – Detention Equipment Contractor.

E. Section 11 98 12 – Detention Doors and Frames.

F. Section 11 98 16 – Detention Fasteners.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. AAMA 800 – Voluntary Specifications and Test Methods for Sealants.
2. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
3. ASTM C1036 – Standard Specification for Flat Glass.
4. ASTM C1048 – Standard Specification for Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.
5. ASTM C1349 – Standard Specification for Architectural Flat Glass Clad Polycarbonate.
6. ASTM D256 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
7. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
8. ASTM D1003 – Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.
9. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.

10. ASTM F1915 – Standard Test Methods for Glazing for Detention Facilities.
11. GANA – Glazing Manual, latest edition.
12. UL 263 – Standard for Fire Tests of Building Construction and Materials.
13. UL 752 – Standard for Bullet-Resisting Equipment.
14. WMFL – Walker, McGough, Foltz, and Lyerla 8801 Attack Resistant Standard.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Submit data on glazing types specified: Provide structural, physical and environmental test characteristics, size limitations, special handling or installation requirements.

C. Product data on glazing sealants, glazing tapes, and setting blocks: Provide functional and environmental characteristics, limitations, and special application requirements. Identify available colors.

D. Samples: Submit two samples, 12 inches x 12 inches in size, illustrating each type of security glazing, clearly marked, in actual assembly for each type.

E. Provide a detailed drawings of intended installation including setting blocks, sealants, and glazing tape along with certification of compatibility with glazing units from the security glazing manufacturer.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with GANA Glazing Manual and Installer's Qualifications: The installation shall be performed only by an installation firm with a minimum of five years' experience in this business. All work shall be performed by qualified mechanics that specialize in security glazing installation.

B. Manufacturer's experience; Manufacturer shall have a minimum of five years' experience, with documented installation of identical product to that specified.

C. Each pane of security glazing shall be permanently identified with a label noting the glazing type and manufacturer. Label shall be fully visible after the glazing is installed in the frame.

1.6 PERFORMANCE REQUIREMENTS

A. Provide WMFL and ASTM F1915 Test Reports certified by independent testing laboratory for each type of security glazing products specified.

1.7 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.8 COORDINATION

A. Coordinate the work with glazing frames, wall openings, and adjacent work.

B. Conduct coordination meeting with at least two weeks prior to the start of work of this Section. Meeting attendees shall include Contractor, installer, glazing manufacturer, painters, and all other relevant trades to review needs concerns impact of other trades on installation of security glazing.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver glazing with manufacturer's labels intact and store in protected areas. Keep glazing free from contamination by materials capable of staining glazing.

B. Deliver glazing sealants, tapes, accessories, and specialty items in manufacturer's unopened, labeled packaging.

C. Handling: Glazing shall be carefully handled and glazed to avoid damage.

1.10 EXTRA STOCK

A. Extra Stock/Spare Parts: Furnish a stock equaling three percent of the quantity required on the project for each product, but not less than one unit of each product, of each size. Provide protection for transit and storage.

B. Size of all attic stock panels shall be determined by Architect.

C. Package, mark for identification, and deliver to Owner's designated storage space as directed.

1.11 WARRANTY

A. Submit under provisions of Division 01.

B. Provide five year warranty against delamination of glass clad polycarbonate security glazing.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. McGrory Glass, Inc., (“AttackDefend” Glass Clad Polycarbonate): Paulsboro, NJ 08066; 800-220-3749, www.mcgrory.com
2. Global Security Glazing ("Secur-Tem+Poly" Glass Clad Polycarbonate): Selma, AL; 800-633-2513, www.security-glazing.com.
3. Oldcastle Building Envelope ("ArmorProtect" Glass Clad Polycarbonate): Santa Monica, CA; 866-653-2278, www.oldcastlebe.com.

B. Substitutions: Under provisions of Division 01.

2.2 SECURITY GLAZING TYPES

A. TYPE SG-1 IG: Insulated glass unit, 1-3/4 inches thick nominal, clear glass clad polycarbonate, ASTM F1915 Security Grade 1 (60 minute) rated with 1/2 inch air space and 1/4 inch heat strengthened glass outboard with SB-70 Low-E coating on #2 surface.

1. Basis-of-Design Product: McGrory Glass AttackDefend 60 IGU

B. TYPE SG-2 IG: Insulated glass unit, 1-3/4 inches thick nominal, 1 inch clear glass clad polycarbonate with white interlayer, ASTM F1915 Security Grade 1 (60 minute) rated with 1/2 inch air space and 1/4 inch heat strengthened glass outboard with SB-70 Low-E coating on #2 surface.

1. Basis-of-Design Product: McGrory Glass AttackDefend 60-WD45 IGU

C. TYPE SG-3: 1 inch thick nominal, clear glass clad polycarbonate, ASTM F1915 Security Grade 1 (60 minute) rated.

1. Basis-of-Design Product: McGrory Glass AttackDefend 60

D. TYPE SG-4: 13/16 inch thick nominal, clear glass clad polycarbonate, ASTM F1915 Security Grade 2 (40 minute) rated.

1. Basis-of-Design Product: McGrory Glass AttackDefend 40

E. TYPE SG-5: 9/16 inch thick nominal, clear glass clad polycarbonate, ASTM F1915 Security Grade 4 (10 minute) rated, meeting or exceeding the requirements of CDCR 860-14a, Appendix H.

1. Basis-of-Design Product: McGrory Glass AttackDefend 10

2.3 GLAZING COMPONENTS

A. Following materials are required as components for units except material requirements are general; provide specific materials as recommended by manufacturer (laminator) of units, to comply with ASTM C1349, specified minimum performance criteria, and additional requirements.

1. Glass Sheets: Type I, quality Q3 glass in conformance with ASTM C1036 and ASTM C1048. Outer layer of all units shall be clear heat or chemically strengthened glass; thicknesses as indicated above.

2. Polycarbonate Sheets: Clear, transparent, cast polycarbonate sheet with additional characteristics and performances as recommended by manufacturer (laminator) of units; with flexural strength of not less than 13,500 psi per ASTM D790; 240 degrees F allowable continuous service temperature; 95 percent light transmittance for 1/4 inch thick sheet per ASTM D1003; Izod strength of 16 foot-pounds per inch minimum per ASTM D256.

3. Interlayer: Clear, transparent, high-impact-resistant permanent urethane film of a composition which has successfully withstood a minimum of twenty years of exposure to sunlight and severe weather/temperature changes as required for specified "arms" rating and overall thickness lamination.

2.4 GLAZING SEALANTS

A. Material: Silicone sealants in conformance with ASTM C920,

1. Sealants shall comply with regulations of South Coast Air Quality Management District Rule 1168 for VOCs.

B. .Acceptable Manufacturers and Products:

1. Exterior Surfaces:

a. Tremco, Product: Spectrem 2.

b. GE, Product: 2200.

c. Substitutions: Under provisions of Division 01.

2. Interior Surfaces – Glazing to Hollow Metal Frame:

a. Pecora, Product: Dynaflex SC Security Sealant.

b. Substitutions: Under provisions of Division 01.

2.5 GLAZING TAPE

A. Material: 100 percent solids butyl tapes in conformance with AAMA 800.

B. Acceptable Manufacturers and Products:
   1. Tremco, Product: POLYshim II Tape.
   2. Parr Technologies, LLC, Product: PTI 303.
   3. Substitutions: Under provisions of Division 01.

2.6 GLAZING ACCESSORIES

A. Setting Blocks: Provide type recommended, subject to compatibility testing and approval by security glazing manufacturer.
   1. Neoprene or EPDM blocks with a Shore A Durometer hardness of 85, ±5 percent, chemically compatible with sealant used.
   2. Santoprene (silicone).
   3. Thermoplastic rubber.

B. Miscellaneous: Furnish all primers, sealers, blocks, shims, spacers, seals etc. as required for a complete installation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify prepared openings for adequacy to receive glazing.

B. Verify openings for glazing are correctly sized and within tolerance.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Apply primer or sealer to joint surfaces wherever recommended by sealant manufacturer.

C. Check that glazing is free of edge damage and surface defects.

3.3 INSTALLATION

A. Install security glazing and accessories in accordance with glazing manufacturer's recommendations.

B. Protect glazing from edge damage at all times during handling, installation, and subsequent operation of the glazed components of the work.

C. Glazing channel dimensions are intended to provide for necessary bite on the glazing, minimum edge clearance and adequate sealant thicknesses, with reasonable tolerances. The glazier is responsible for correct glazing size for each opening, within the tolerances and necessary dimensions established and for verifying the dimensions of the glazing stops.

D. At all interior detention doors and frames scheduled to receive security glazing, apply pick-proof sealant and set flush with edge of stop. Protruding sealant not installed in a neat, flush, professional manner shall be completely removed and replaced at no cost to Owner. Do not allow security sealant to come in to contact with polycarbonate surfaces.

3.4 CURE AND PROTECTION

A. Cure glazing sealants, in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.

B. Protect glazing sealants and compounds during the construction period, so that they will be without deterioration or damage (other than normal weathering) at the time of Project Completion.

C. Remove and replace glazing that is broken, chipped, cracked, abraded or damaged during the construction period.

D. Leave entire work in neat, orderly, clean condition at time of Project Completion.

3.5 CLEANING GLAZING

A. Clean glazing under provisions of Division 01 and per glazing manufacturer’s recommendations.

B. Maintain glazing in a clean condition during construction so that it will not be damaged by corrosive action and will not contribute (by wash-off) to the deterioration of glazing materials and other work. Use only glazing manufacturer approved cleaning solutions.

C. It shall be the responsibility of the Contractor to provide the Owner with the security glazing manufacturer’s proper cleaning instructions, assuring that only compatible cleaning products are to be used. Failure to do so may void the glazing warranty.

END OF SECTION

SECTION 11 98 16

DETENTION FASTENERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Security Screws.

1.2 RELATED SECTIONS

A. Section 11 98 00 – Detention Equipment Contractor.

B. Section 11 98 12 – Detention Doors and Frames.

C. Section 11 98 14 – Detention Door Hardware.

D. Section 11 98 36 – Detention Furnishings.

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Division 01.

1.4 COORDINATION

A. Coordinate Work and scheduling of the Work of this Section with other trades for anchorage and location.

1.5 INSPECTION

A. Examine all subsurfaces to receive Work and report, in writing, to General Contractor, with a copy to the company, any conditions detrimental to work. Failure to observe this injunction constitutes a waiver to any subsequent claims to the corrections the company may require. Commencement of Work will be construed as acceptance of all subsurfaces.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver all manufactured materials in original containers bearing manufacturer's name and brand. Use only one brand for material throughout job. Store materials within building in locations directed by General Contractor.

PART 2 PRODUCTS

2.1 SECURITY SCREWS

A. All exposed fasteners in the project, including fasteners used in fabrication of project components, shall be security screws as specified herein, whether called for on the drawings or not, unless the components or location is specifically excluded by inclusion on the list below.

B. Excluded Items and Locations:

1. Mechanical, electrical, generator or electronic equipment rooms, including roof-mounted equipment.

2. Control rooms and attendant equipment in those rooms, except control panel.
3. Above suspended ceilings, behind access panels and within pipe or duct chases.
4. Kitchen, medical, property and laundry equipment.
5. Shower doors or standard (porcelain) plumbing fixtures.
6. Movable furnishings, storage shelving, cabinet hardware.
7. Wall board screws.
8. All areas not within the secure perimeter of the facility.

C. All security screws shall be operable by tools produced for use on the specified security screws by manufacturer or other fabricators licensed by them.

D. Security screw head style and plating shall be selected as appropriate for installation requirements, strength and finish of adjacent materials except that all screws in painted materials shall be stainless steel. Size and shape variation shall be such that no more than six different tools/wrenches are required for all security screws on projects.

E. Types Allowed:
1. Pinned "Torx" head.
2. Pinned "Allen" head.

F. Provide three complete sets of tools required for all security screws on the project.

2.2 MANUFACTURERS

A. Security screws may be obtained through the following dealers:
1. Riteloc Company, Freeport, NY; 516-378-1020.
2. Hol-Krame Company, West Hartford, CT; 203-523-5235.
3. Tamper-Pruf Screws, Inc., Paramount, CA; 213-531-9364.
4. Camcar Division of Textron, Inc., Rockford, IL; 815-226-7721.
5. Safety Socket Screw Corporation, Chicago, IL; 312-763-2020.
6. Bryce Fastener Company, Inc., Seattle, WA; 800-542-7031.

B. Substitutions: Under provisions of Division 01.

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation detention fasteners in accordance with the manufacturer's instructions.

B. Check and adjust all operating mechanisms to insure proper function in accordance with the manufacturer's recommendation.

3.2 CLEAN-UP

A. Clean work under provisions of Division 01.

END OF SECTION

SECTION 11 98 19

DETENTION ROOM PADDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall and floor room padding.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 04 22 00 – Concrete Unit Masonry.

C. Section 11 98 00 – Detention Equipment Contractor.

D. Section 11 98 12 – Detention Doors and Frames.

E. Section 11 98 36 – Detention Furnishings.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM D395 – Standard Test Methods for Rubber Property – Compression Set.
2. ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
3. ASTM D471 – Standard Test Method for Rubber Property – Effect of Liquids.
4. ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness.
5. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

C. Shop drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.

D. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.

1.5 QUALITY ASSURANCE

A. Room padding shall be State Fire Marshal approved and listed and shall be installed in accordance with the listing No. 2160-976:101.

B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.6 SUBMITTALS

A. Submit under provisions of Division 01.

B. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

C. Shop drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.

D. Manufacturer's recommended installation procedures which, when accepted by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.

PART 2 MATERIALS

2.1 MANUFACTURERS

A. Basis-of-Design: Marathon Engineering Corp., Mountain Ranch, CA 209-754-5121; www.goldmedalsafetypadding.com. Product: Gold Medal Safety Padding.

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Materials:

1. Protective padding material shall be a synthetic resinous material. Closed cell polyvinyl chloride or other types of polyvinyl chloride surfacing material will not be permitted.
2. Safety padding must include a 1/8 inch thick low-smoke neoprene coating.

B. Properties:

1. Comply with ATSM E84, Class A.
   a. Flame Spread: 5.
   b. Smoke Developed: ≤20.
   c. Critical Radiant Flux of Floor Covering Systems: >0.99 W/cm² - Class I.
2. Hardness: Durometer reading shall be 60, ±5.
3. Weight: Approximately five pounds per square foot.
4. Tensile Strength: 300 psi minimum per ASTM D412.

5. Temperature Stability: Resilience unaffected from 20 degrees F to 120 degrees F.
6. Compression Set: 90 percent recovery after 72 hours.
7. Moisture Absorption: 0.8 percent to 1.05 percent by weight.
8. Acute Oral Toxicity Test: Non-toxic.
9. Compression Properties: 30 psi to 70 psi at 50 percent modulus.
10. Fungus Resistance: Completely resistant 0,0,0, per MIL-I-531-D.
11. Elongation at Break: 150 percent per ASTM D412.

2.3 FABRICATION

A. All vertical panels shall be prefabricated. Panels shall be 1 inch nominal thickness padded material bonded to 7/16 inch thick oriented strand board, with an overall panel thickness of 1-1/2 inches.

B. Door jambs shall be 1/2 inch thick padding for a total of 1 inch thickness on door jambs.

C. All floor panels shall be prefabricated. Panels shall be 3/4 inch nominal thickness padded material bonded to 7/16 inch thick oriented strand board, with an overall panel thickness of 1-1/4 inches (tolerance of ±1/8 inch).

PART 3 EXECUTION

3.1 SURFACE CONDITONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Coordinate as required with order trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as accepted by the Architect, anchoring all components firmly into position for long life under hard use.

C. All vertical panels shall be mechanically fastened to walls.

D. A gap of 1/8 inch ±1/16 inch shall be left between panels. Gaps shall be filled with epoxy compound. When epoxy compound is fully cured, it shall be sanded to be flush with adjacent panel edges.

E. All fastener holes shall be filled with epoxy and sanded flush. Upon completion of sanding of all surfaces, apply a finish topcoat on all surfaces.

END OF SECTION

SECTION 11 98 21.13

ELECTRICALLY OPERATED DETENTION WINDOWS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrically operated steel maximum detention awning-type windows.

B. Detention window anchors, mullions, covers, and trim.

C. Electric window operators.

D. Factory applied finishes.

E. Detention screens.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 07 62 00 – Sheet Metal Flashing and Trim.

C. Section 07 92 00 – Joint Sealants.

D. Section 11 98 00 – Detention Equipment Contractor.

E. Section 11 98 15 – Detention Security Glazing.

F. Division 26 – Electrical.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM A627 – Standard Test Methods for Tool-Resisting Steel Bars, Flats, and Shapes for Detention and Correctional Facilities.
2. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.
3. ASTM D714 – Standard Test Method for Evaluating Degree of Blistering of Paints.
4. ASTM D1654 – Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
5. ASTM D4541 – Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
6. ASTM D4585 – Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation.

7. ASTM D5894 – Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet).
8. ASTM E283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
9. ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
10. ASTM F1592 – Standard Test Methods for Detention Hollow Metal Vision Systems.
11. ASTM G85 – Standard Practice for Modified Salt Spray (Fog) Testing.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Samples:
   1. Typical corner sample.
   2. Color sample of finish.
   3. Hardware.

C. Shop Drawings and Manufacturer's Literature:
   1. Submit shop drawings showing full size window and installation details including anchorage, fastening, and recommended sealing methods.
      a. Provide dimensioned elevations showing window openings and window sizes.
      b. Provide wiring diagrams for actuator controls and connections.
   2. Color charts for standard finishes and sealants.
   3. The manufacturer shall not commence any work until shop drawings have been accepted.

1.5 QUALITY ASSURANCE

A. Manufacturer shall have not less than ten years' experience in the fabrication of steel detention windows and shall be a member of The Steel Window Institute (SWI).

B. Experienced steel window installers shall perform installation of windows.

C. Allowable Tolerances: Size dimensions +/- 1/16 inch.

D. Performance Requirements:
   1. Air infiltration test: Meets or exceeds ASTM E283, maximum air infiltration 0.37 cubic feet per minute per foot of crack length with pressure differential across the window unit of 1.57 pounds per square foot.
   2. Water Penetration Test: Meets or exceeds ASTM E331, no water penetration for 15 minutes when the window is subjected to a rate of flow of 5 gallons per hour per square foot with differential pressure across the window unit of 2.86 pounds per square foot.
   3. Tool-resisting Steel: Meets or exceeds ASTM A627 Grade 4, submit test reports from a qualified independent testing laboratory verifying that the window manufacturer's tool-resisting steel is in conformance with ASTM A627.

4. Impact Test: Meets or exceeds ASTM F1592 “Standard Test Methods for Detention Hollow Metal Vision Systems”.
    a. Impact Blows: Must withstand a minimum of 600 blows at each impact location; 1200 total blows per frame without rail bar, 1800 total blows per frame with rail bar.
    b. Glazing Test: The glazing and panels shall remain in place. No damage to the extent that forcible entry can be achieved.
    c. Frame Test: No welded joints or the entire frame joint shall completely separate.
    d. The wall anchoring shall retain the frame in place throughout the test procedure to the extent that forcible entry cannot be achieved.
5. Quality of e-coat/ top-coat combination shall meet or exceed the following ASTM designations:
    a. ASTM D714 - Paint Blistering Test.
    b. ASTM D4585 – Humidity Test.
    c. ASTM B117 – Salt Spray (Fog) Test.
    d. ASTM D1654 – Painted Products in Corrosive Environments.
    e. ASTM G85 – Cyclic Fog/Dry Test (Prohesion).
    f. ASTM D5894 – Salt Fog/UV Painted Metal.
    g. ASTM D4541 – Pull Off Strength of Coating Test.
6. Along with submittals, the window manufacturer shall provide the applicable test report from a qualified independent testing laboratory regularly engaged in testing windows to verify that the products conform to these test requirements. All testing must be current and meet minimum requirements in conformance with Specifications.

1.6 PRODUCTS, STORAGE AND HANDLING

A. Contractor shall be responsible for protection and storage of windows after delivery to the site.

B. Store in designated areas as close as possible to point of installation.

1.7 WARRANTY

A. Provided manufacturer’s standard one year warranty.

PART 2 PRODUCT

2.1 MANUFACTURER AND PRODUCT

A. Acceptable Manufacturer:
    1. Basis-of-Design: Hope’s Windows, Inc., Jamestown, NY; 716-665-5124, hopeswindows.com. Product: SEL10 Steel Electrically Operated Awning Detention Windows with Dayton Standard Drive Tube Linear Actuator.

B. Substitutions: Under provisions of Division 01.

2.2 WINDOW CONFIGURATION

A. Steel maximum detention awning-type windows with horizontal steel detention bars spaced 6 inches on center, concealed within the head rail of each ventilator and in the sill of the frame. Horizontal steel detention bars shall penetrate vertical steel detention bars concealed in the jambs of the frame to form an integral detention grid. Ventilators shall be linked together to operate in unison by a concealed, electrically operated gearbox mechanism.

2.3 MATERIALS

A. The perimeter framing and removable covers shall be formed from 12-gauge steel.

B. Ventilator jamb and sill sections shall be hot rolled steel. Sections shall weigh not less than 1.93 pounds per foot and be not less than 1-7/16 inches front to back.

C. Ventilator head rails shall be formed from not less than 12-gauge steel.

D. Detention windows shall have detention bars of 1 inch round and 1/4 inch x 2-1/2 inch flat tool-resisting steel conforming to ASTM A627.

E. Sill and jamb weather-stripped ventilator bedding stop shall be extruded aluminum alloy 6063-T5 with a minimum thickness of 0.125 inches.

F. Glazing beads shall be extruded aluminum alloy 6063-T5 with a minimum thickness of 0.055 inches.

G. Weather-stripping shall be neoprene.

H. The actuator shall be manufactured by Dayton with the following attributes: ***Who, where, what controls the operation of the actuator?***

1. Motor: Synchronous single phase motor; 120 volt.
2. Terminal strip, resistors, and capacitors.
3. Rotary limit switches.
4. Gear reducers as required to effectively operate vent assembly.

I. All linkage arms shall be steel not less than 3/16 inch x 1-3/8 inch and located at both jambs of each unit.

J. All vertical connecting bars shall be not less than 3/16 inch x 1-1/4 inch and located at both jambs of each unit.

K. Brass or bronze bearings shall be provided at all wearing points on the pivotal bars and linkage mechanism.

L. Anchors shall be fabricated from steel angles with a minimum thickness of 3/16 inch.

M. Detention Screens: ***Option***

1. Fixed Angle Frame:
   a. Frames shall be steel angles formed from 12 gauge steel.
   b. Steel clamp strip shall be 12 gauge steel.
   c. Screen cloth shall be stainless steel, Type 18/8, Alloy 304, woven 12-mesh to the inch from 0.028 inch diameter wire, double crimped.

N. All screws shall be tamper-resistant truss-head plated steel.

O. Factory-applied Paint System:

1. Pre-treatment.
2. Primer – E-Coat (Electrodeposited epoxy primer).
3. Finish coat – Factory applied polyurethane paint. Color as selected by Architect.

2.4 FABRICATION

A. Fabricate windows in accordance with accepted shop drawings.

B. Prior to fabrication, shot blast clean all hot rolled steel sections.

C. Frame members shall be coped and welded at corners the full depth of the frame for maximum strength and weather tightness with exposed face welds dressed smooth.

D. Anchors shall be located a maximum of 18 inches on center and shall be a minimum of 2 inches long.

E. All removable covers or trim, either exterior or interior, shall be field attached with tamper-resistant screws, spaced not more than 9 inches on center at the interior and spaced not more than 12 inches on center at the exterior.

F. Horizontal 1 inch round detention bars shall penetrate the vertical 1/4 inch x 2-1/2 inch flat detention bars concealed within the jambs.

G. Ventilator jamb and sill bar shall be solidly welded with exposed faces and contact surfaces dressed smooth. The head rail shall be coped and welded to the jamb bar. The jamb and head bars shall be welded to the 1 inch round pivotal bars.

H. Operating Hardware:

1. The 1 inch round pivotal bars shall be continuous and have a welded linkage near each end. The linkage arms at each jamb shall be attached to a flat connecting bar by a pivot pin controlling the ventilators in unison to a maximum opening of 50 degrees.
2. The linkage arms of the lower ventilator shall be connected to bell cranks by means of an adjustable link, which provides for adjustment of the ventilators.
3. A bell crank shall be welded to each end of the 3/4 inch diameter power shaft.
4. The 3/4 inch power shaft shall be connected to the power with an overload safety device.
5. The power unit shall be located and concealed within the sub frame of the window.
6. A motorized power unit located in the sill of the sub frame shall accomplish opening and closing of the ventilators.
7. The 3/4 inch diameter shaft, power unit, bell cranks, and adjuster links shall be removable from the window.

I. The aluminum sill and jamb weather-stripped ventilator-bedding stop shall be attached to the frame with concealed screws, spaced a maximum of 12 inches on center. Exposed screws will not be acceptable.

J. Weather-stripping shall be factory applied in the same plane around the interior contact surface of the ventilator.

K. Glazing:

1. Ventilators shall be designed for outside glazing.
2. Provide replaceable continuous glazing beads to suit the glass.
3. Glazing beads shall be cut and shop fitted to each glass lite prior to shipment.
4. Glazing beads shall be attached with tamper-resisting screws spaced a maximum of 9 inches on center.
5. Glazing shall be Type SG-2. Refer to Section 11 98 15 for additional information.

L. Detention Screens:

1. Fixed Angle Frame:
   a. Frames shall be welded solid at corners and welds dressed smooth.
   b. Secure screen cloth to frame using special security screws spaced 4 inches on center, which penetrate the frame, screen cloth and clamp strip.
   c. The screen frame and clamp strip shall be factory finished to match the window finish.

M. Factory Finishing:

1. Shot Blasting:
   a. Prior to any machining or welding, all hot-rolled steel sections shall be cleaned by shot blasting to remove any loose scale.
2. Bonderizing:
   a. After fabrication, windows, mullions, covers, and trim shall be subjected to a ten stage bonderizing pre-treatment process to produce a non-metallic phosphate coating on the surface of the steel in preparation for e-coat priming system.
3. E-Coat Prime Painting:
   a. Following pretreatment, windows and accessories shall be e-coated with a cathodic epoxy primer of PPG Powercron 8000 or accepted equal to ensure all surfaces are evenly covered. Spray or dip primers will not be acceptable.
   b. Immerse in a rinse of ultra-filtered RO water for 3 minutes to remove all excess paint and remove any runs.
      1) The above process shall be repeated once to further improve surface conditions.
   c. The primer shall be oven baked to 335 degrees F for 15 minutes to a dry film thickness of 0.7 mil to 1.0 mil.
   d. The material shall be cooled in preparation for the finish coat.
4. Ultrathane Finish Painting:
   a. Following the prime coat, windows and accessories shall be given a spray coat of acrylic polyurethane and oven baked at 225 degrees F for 15 minutes to dry film thickness of 1.5 mils to 2.0 mils.
   b. Combined overall dry film thickness of the prime coat and finish coat shall be 2.2 mils to 3.0 mils.
   c. Architect shall select color from an unlimited color selection. ***Note: Some colors may require clear coats for added protection.***

PART 3 EXECUTION

3.1 INSPECTION

A. Window openings shall conform to details, dimensions, and tolerances shown on the window manufacturer's accepted shop drawings.

B. Contractor shall correct conditions which may adversely affect the window installation before installation commences.

3.2 INSTALLATION

A. Experienced personnel shall install windows.

B. Install windows in openings in strict accordance with accepted shop drawings.

1. Set windows plumb, level, and true to line without warp or rack of frames or ventilators.
   a. Ventilators shall be in the closed position when windows are being installed.
2. Anchor windows securely to surrounding construction with minimum 1 inch long welds at anchor points. Maximum distance between weld points shall be 18 inches.
3. Exterior joints between the windows, trim, and mullions shall be properly sealed watertight with an acceptable sealant and neatly pointed.
4. Windows shall be checked and adjusted after installation and before glazing to ensure proper fit of ventilator to frame and to ensure the operating mechanism works freely and satisfactorily.

C. Install detention screens.

D. Repair any abraded areas of the factory finish.

3.3 CLEANING

A. Window installer shall leave the window surfaces clean after installation and ready to receive glass and glazing. The window installer shall not be responsible for final cleaning.

B. Any protection necessary due to cleaning adjacent materials shall be the responsibility of the Contractor.

END OF SECTION

SECTION 11 98 23

DETENTION MESH SCREEN

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Security mesh screen.

1.2 RELATED SECTIONS

A. Section 09 22 16 – Non-Structural Metal Framing.

B. Section 11 98 00 – Detention Equipment Contractor.

1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Materials list of items proposed to be provided under this Section.

C. Manufacturer's data needed to provide compliance with the specified requirements.

D. Shop drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.

E. Manufacturers' recommended installation procedures.

1.4 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

PART 2 PRODUCTS

2.1 SECURITY MESH SCREEN

A. Kane Manufacturing Corporation. Products: “Protector” security frame and mesh screen.

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Mesh shall be 0.047 inch diameter galvanized steel; 28.1 percent open area with 0.053 inch space between wires; tensile strength shall be 1,600 pounds per lineal inch after weaving.

B. Tubular screen frame shall be fixed; not more than 1-1/2 inches wide and extruded from alloy 6063-T6 tubular aluminum with wall thickness of not less than 0.090 inch.

1. Corners of screen shall be mitered continuously electric-flash welded and dressed smooth to provide no evidence of mitered corner joint.

C. Finish: Factory belt sanded and lacquered.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the original design, the approved shop drawings, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as accepted by the Architect, anchoring all components firmly into position for long life under hard use.

END OF SECTION

SECTION 11 98 26.13

DETENTION METAL PERSONNEL LOCKERS AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal personnel locker units with hinged doors.

B. Benches.

C. Equipment.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 04 22 00 – Concrete Unit Masonry.

C. Section 09 22 16 – Non-Structural Metal Framing.

D. Section 11 98 00 – Detention Equipment Contractor.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM A1008/A1008M – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

1.4 SUBMITTALS

A. Submit under provisions of Division 01

B. Shop Drawings: Include details of layout and installation, as well as clearances, spacing, relation to adjacent construction, elevation, trim pieces, components, assemblies, connections, attachments, reinforcements, and anchorage detail. Furnish floor layouts and technical and installation manuals.

C. Product Data: Submit manufacturer's product literature, schematics, testing data, and other items for each product described in this Section. Include data substantiating that products to be furnished comply completely with requirements of the contract documents and specifications. Include installed weight, furnished specialties, and accessories.

D. Samples: Three 3-1/4 inch x 1-1/2 inch paint samples of color selected by Architect.

E. Sustainable Design Submittals:
   1. Recycled Content.
   2. Regional Materials.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum ten years' experience in work of this Section.

B. Installer Qualifications: Minimum two years' experience in work of this Section.

C. Accessibility: Conform to Americans with Disabilities Act - 2010 Standards for Accessible Design and CBC Chapter 11B for accessible locker units.

1.6 WARRANTIES

A. Manufacturer's five year warranty against defects in materials and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design: Tiffin Metal Products Company, Tiffin, OH; 800-537-0983, www.tiffinmetal.com. Products:
   1. Sentinal Airflow Locker.
   2. Benches.
   3. Firearms and Armory Racks.

B. Spacesaver.

C. Substitutions: Under provisions of Division 01.

2.2 SYSTEM DESCRIPTION

A. Metal Lockers:
   1. Configuration: Single tier with base drawer unit.
   2. Locker Size: 18 inches wide x 24 inches deep x 66 inches high.
   3. Base Drawer Unit Size: 18 inches wide x 36 inches deep x 18 inches high.
   4. Two Tier Accessible Lockers: 18 inches wide x 24 inches deep x 84 inches high.

B. Locker Room Benches:
   1. Sizes:
      a. Standard: 12 inches deep x 18 inches high x lengths as indicated on Drawings, with four pedestals per bench.
      b. Accessible: 48 inches long x 24 inches deep x 18 inches high, with three pedestals per bench.
   2. Benchtop: Hardwood with two coats of acrylic clear finish.
   3. Pedestals: 14 gauge enameled steel with 1-5/8-inch tubing uprights. Color: Same as locker color.

C. Firearms and Armory Racks:

1. Model No. WRL42168404HSAE_01 metal lockers with the following characteristics:

a. Size: 42.270 inches wide x 83.750 inches high x 16.091 inches deep.

b. Firearms rack interior components shall hold ten long guns, ten pistols, and ten shelves.

1) Two each Model No. WKT000005RFAA 5W barrel holders.

2) One each Model No. WKT000010SBAA 10W slot base.

3) Two each Model No. WKT 000005HPAA 5W pistol holder.

4) Ten each Model no. WKT 000005SKAA 5W shelves.

c. Shield/miscellaneous storage rack interior components shall hold five each Model no. WKT 000005SKAA 5W shelves.

d. Doors shall be perforated and lockable with provision for padlock.

e. Locker Color: As selected by Architect from manufacturer's full range of standard colors.

2.3 MATERIALS

A. Steel Sheet: Conforming to ASTM A1008/A1008M.

1. Recycled Content: Minimum 30 percent recycled steel, with minimum 30 percent classified as post-consumer.

2.4 LOCKER FABRICATION

A. Construction:

1. Doors: Minimum 16 gauge steel.
2. Back Panels and Top Panels: Minimum 14 gauge steel.
3. Side and Bottom Panels: Minimum 14 gauge steel.

B. Doors:

1. Louverless venting shall be by perforated panel just below door.
2. Door Hinges: 14 gauge steel, continuous type, concealed, 180 degree opening.
3. Latch shall engage at both upper and lower points with heavy rod and latch.
4. Double door configuration shall be provided for each locker upper.

C. Frames:

1. 14 gauge formed and welded into integrated units with doors installed.
2. Body parts flanged and angled to provide rigidity; assembled by welding, bolting, or riveting using corrosion-resistant bolts and aluminum or stainless steel rivets.
3. Provide mounting holes for attaching lockers back-to-back and side-by-side.
4. Front panel under door and top panel shall be perforated to allow for air flow.

D. Internal Components:

1. Shelves:

a. Steel, 16 gauge minimum.

1) Two large upper shelves, one above hanger bar (full width x 13.9 inches deep) another above the first (full width x 20.7 inches deep).
2) Shelves spaced 2 inches off back panel for unobstructed ventilation.
3) Two small shelves under hanger bar with valuables compartment below.
4) Upper small shelf shall be recessed to allow clearance for vertical radio charging above lock box.

2. Double hook for storage.
3. Single coat hook on each side panel.
4. Unbreakable mirror with magnetic attachment.
5. Pegboard panels on inside of doors.

E. Drawer Unit:
1. Located under upper locker unit.
2. Full frame box construction complete and independent from upper unit.
3. Width to match locker x 36 inches deep x 18 inches high.
4. 200 pound capacity drawer slides.
5. Integrally formed ventilated handles.
6. Keyless lock; locks when locker door is closed. Released by pull handle inside locker.

F. Bench: Hardwood, attached to top of drawer unit at each locker with 36 inch deep drawer.

G. Door Locks and Latches:
1. Lift latch operated, top and bottom bayonet style.
2. Recessed door latch, painted cup with integral door latch/pull, pry-resistant, not protruding beyond face of door.
3. Locks: Combination locks with master key override; furnish two master keys.

H. Number Plates:
1. Number plates furnished loose and affixed to locker using pop rivets in pre-drilled holes in door.
2. Number doors as directed by Owner.

I. Accessories:
1. Continuous sloping tops, minimum 24 gauge steel.
2. Finished end panels without exposed fasteners.
3. Filler panels as required to fill all external gaps.

2.5 FINISHES

A. Steel:
1. Minimum 3 mil thick factory-applied baked-on textured powder coat finish.
2. Color: As selected by Architect from manufacturer's full color range.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved Shop Drawings.

B. Set plumb, level, and aligned.

C. Attach lockers to supporting construction with anchors best suited to substrate conditions.

D. Bolt adjacent locker units together to provide rigid installation.

E. Install end panels, filler panels, and sloped tops.

3.2 ADJUSTING

A. Adjust doors and latches to operate correctly.

END OF SECTION

SECTION 11 98 33

DETENTION SECURITY CEILING ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Security acoustical pan and plank metal ceilings.
   1. Grade 2 security single skin plank type acoustical ceiling systems.

1.2 RELATED SECTIONS

A. Section 11 98 00 – Detention Equipment Contractor.

B. Divisions 21 – 23 – Mechanical.

C. Divisions 25 – 27 – Electrical.

D. Division 28 – Security Equipment.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:
   1. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   2. ASTM A1008/A1008M – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
   3. ASTM C423 – Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   4. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
   5. ASTM F2322 – Standard Test Methods for Physical Assault on Vertical Fixed Barriers for Detention and Correctional Facilities.
   6. AWS D1.3 – Structural Welding Code - Sheet Steel.
   7. ISO 9001 - International Standards Organization – Standards for Quality Management.
   8. CISCA Guidelines.

D. Abbreviations:

1. DEC: Detention Equipment Contractor.
2. ASTM: American Society for Testing Materials.
3. AWS: American Welding Society.
4. CISCA: Ceilings and Interior Systems Construction Association.

1.4 SUBMITTALS

A. Shop Drawings:

1. Submit in accordance with Division 01.
2. Provide detailed drawings including: layout of ceiling systems, details of construction, gauges of metal, anchoring details, conditions at openings, installation details and methods, and other data pertinent to the installation, including illustration of sequence of installation to accomplish interlocking panels.
3. Do not begin fabrication of material until shop drawings have been reviewed by the architect.

B. Samples:

1. Supply a 1 foot x 1 foot section of each ceiling system being supplied showing wall mounting members and panel sections.
2. All samples submitted shall be of the production type and shall represent in all respects the minimum quality of work to be furnished by the manufacturer. No work represented by the samples shall be fabricated until the samples are approved, and any downgrading of quality demonstrated by the samples can be cause for rejection of the work.

C. Test Report:

1. Manufacturer shall submit an independent testing laboratory report certifying that ceiling assemblies meet the performance requirements of and are constructed in accordance with this Section.

1.5 TESTING AND PERFORMANCE

A. Security grades for each security ceiling type shall be indicated on the reflected ceiling plan.

B. Acoustical Performance:

1. Single skin plank ceiling system shall provide an NRC of not less than 0.90 when tested in accordance with ASTM C423.
2. Acoustical fill flame spread index shall not exceed 15 with smoke developed value not exceeding 5 when tested in accordance with ASTM E84.

C. Security Performance:

1. These test methods are not to provide a measure of resistance for ceiling assemblies subjected to attack by corrosive agents.
2. These test methods are intended to evaluate simulated forced exit resistance of a ceiling assembly to attacks using battering devices and static loading.

3. The primary purpose of these test methods is to approximate the levels of abuse to which ceiling assemblies may be subjected in the course of a forced exit in a correctional facility. The desired result of its use is to help provide insurance of protection and safety of the inhabitants or occupants of the facility where these ceiling assemblies will ultimately be used.

D. Specimen Preparation:

1. The construction and size of the test ceiling assemblies consisting of single or double skin ceiling panels, wall mounting channels and angles, compression struts, main runners, cross tees, hangers, and fasteners shall be representative of the application under investigation and the desired security classification needed for the application. The same basic construction and size of test assemblies shall apply to all tests.
2. The test assembly shall be installed in a fixture typically constructed from steel tube, I-beam, angles, and 2 inch x 6 inch wood members. The fixture shall simulate the rigidity normally provided to a ceiling system in a building by the roof, floor and walls and shall be constructed in a manner that will not contribute to the deflection of the ceiling assembly when under static loading or impact loading. Figure 1 shows an acceptable fixture.
3. Mount the ceiling assembly under test in the rough opening in accordance with the manufacturer's installation instructions.

E. Procedures:

1. Ceiling Assembly Impact Testing:
    a. Impact testing under this section is performed using the methods and testing equipment described in ASTM F2322.
    b. Scope: These tests are designed to evaluate a ceiling assembly's ability to resist repetitive impact forces at the designated critical areas. The same assembly used for the static load tests may be reused for this test, or another assembly may be used if so desired.
    c. Significance of Use: This test method is intended to closely simulate a sustained battering ram-style attack and provide an evaluation of the assembly's capability to prevent, delay and frustrate forced exit. This impacting simulates a person using a sledgehammer or another battering implement to escape or exit through the ceiling system.
    d. Apparatus: The test fixture described in this Section and shown in Figure 1 shall be used in this test.
        1) Ram: The ram shall be a pendular system with a steel weight capable of delivering horizontal impact of up to 200 ft. lbf. The weight of the ram shall be 80 lb. +/- 0.25 lb. The striking nose of the ram shall be made from C1010-1020 carbon steel, the striking surface area of which shall be 4.0 +/- 0.04 square inches. Refer to Figure 5 Steel Impact Ram found in ASTM F2322.
    e. Procedure: Subject each location on the sample ceiling to the number of blows at the required impact energy found in Table 1 and Figure 2. The impactor shall deliver the required impacts at the specified foot pounds per impact. Repeatability of impact location during each series shall be no more than +/- 2 inches horizontally and vertically from the designated impact target. Testing shall take no longer than 60 minutes. Specimen fails if a 5 inch x 5 inch x 8 inch rectangular box can pass through the wall following impacts.

2. Static Load Testing (uplift):
    a. Scope: This test is designed to evaluate the capability of a ceiling assembly to resist a steadily increasing force applied at corner points, joints between ceiling panels, and the ceiling assembly's central point.
    b. Significance of Use: This test method is intended to simulate a ceiling assembly's resistance to uplift at vulnerable locations.
    c. Apparatus: The test fixture and wall described in this Section shall be used in this test.
        1) A hydraulic ram and pump equipped with a gauge or load cell shall be used to provide the static load. The pump ram and gauge shall be calibrated by the testing laboratory and a chart provided that converts pounds-force per square-inch gauge (kilograms per square meter) to pounds-force (Newton's). If a load cell is used, it shall be certified by the testing laboratory prior to use. (see figure 3 Static Load Apparatus)
    d. Procedure: Apply static load to the attack side of the component at the locations and magnitude appropriate to the security rating desired in accordance with that specified in Table 1. Specimen fails when the desired load cannot be achieved without physical failure or the ability for egress.
    e. Record the pass / fail results at 100 pound increments to produce a graph, static load versus failure. Increase the load until target loads for each sample are reached.

TABLE 1

Static Load (up lift) Test					Impact Test			
Security Grade	Panel Material Thickness	@ Corner Lbs / in^2	@ Joint Lbs / in^2	@ Center of Panel @ Center of Room Lbs / in^2	Impact Energy of Each Blow Ft. Lbs.	@ Corner Number of Blows	@ Panel Joint Number of Blows	@ Center of Panel @ Center of Room Number of Blows
2	0.067	1000	1000	1000	150	100	100	100

1.6 QUALITY ASSURANCE

A. Manufacturer's Qualification:
    1. Manufacturer shall provide evidence of having personnel and plant equipment capable of fabricating ceiling assemblies of the type specified herein. Manufacturer shall provide current documentation of the number of employees, a listing of their production equipment, and a description of their manufacturing facility.
    2. Manufacturers shall be ISO 9001, 2008 certified and shall be required to present their Certificate of Registration upon request. The manufacturer's registrar shall be nationally recognized and shall provide the manufacturer with periodic factory follow up audits reaffirming the manufacturer's continuing compliance with their written quality program.
    3. Manufacturer's production welders shall be qualified under AWS D1.3 and upon request shall provide copies of Welders Certifications in accordance with AWS D1.3.
    4. Manufacturers shall have a minimum of five years of experience successfully producing security ceiling systems of the types and sizes required in the contract documents. Upon request the manufacturer shall provide a list of successfully completed projects and the dates they were completed.

5. Manufacturers shall have written test reports of their having passed the testing requirements of this Section and using their current materials and production processes.

B. Subcontractor (DEC) qualifications:

1. Technically qualified and experienced in furnishing and installing detention security acoustical panel.
2. Welders and tackers shall be qualified by the American Welding Society's procedure AWS D1.3.
3. Has full time employees with a minimum of five years of experience in furnishing and installing detention equipment and detention security systems.
4. Direct distributor or dealer for the manufacturer of detention security acoustical panel system specified or approved.
5. Submit evidence of prior experience in the installation of metal security ceiling systems.

C. Quality Criteria:

1. All ceiling construction shall be in accordance with construction of assemblies which meet the testing requirements of this Section.
2. Fabrication methods and product quality shall meet standards specified herein.
3. Job Site Check:

a. A ceiling panel at the job site shall be selected at random and sawed in half or otherwise taken apart as deemed necessary for verification that construction is in accordance with the requirements of this Section. The manufacturer shall include the cost of the replacement panel. If the panel construction does not conform to the requirements of this Section, the non-conforming panels shall be repaired or replaced at the manufacturer's expense.

1.7 WARRANTY

A. All ceiling systems work shall be warranted from defects in workmanship and quality for a period of one year from project completion.

PART 2 PRODUCTS

2.1 SECURITY CEILING SYSTEMS

A. Manufacturers:

1. Trussbilt, Vadnais Heights, MN; 651-633-6100, www.trussbilt.com. Product:

a. BarrierDek Security Grade 2 single skin inter-locking plank ceiling systems.

2. Substitutions: Under provisions of Division 01.

B. Materials:

1. Panel face sheets shall be made of commercial quality, level, 12 gauge, perforated, cold-rolled steel conforming to ASTM A1008 / A1008M CS Type B and shall have a zinc coating applied by the hot-dip process conforming to ASTM A653/A653M Commercial Steel (CS), coating designation A40. The steel shall be free of scale, pitting, coil breaks or other surface blemishes. It shall also be free of buckles, waves or any other defects caused by the use of improperly leveled sheets.

C. Construction:

1. Single skin inter-locking plank ceiling system – Security Grades 2:

a. Ceiling Planks: Shall be 18 inches wide by length as required to minimize midspan joints in all rooms. All ceiling planks shall have factory formed inter-locking edges and shall be perforated with 0.125 in. diameter holes, staggered 0.218 inch on center for a 29 percent open area.

b. Wall Perimeter Angles: Shall be formed angles 0.094 inch minimum thickness and punched 16 inches on center for 3/8 inch diameter expansion anchors. Panels shall be secured to the wall angles using 12 gauge concealed angle clips.

c. Interim Tee Supports: Tee supports shall be two wall mounting angles bolted back-to-back using 3/8 inch diameter – 16 bolts, 24 inches on center.

1) Suspension for Tee supports shall be 3/8 inch diameter galvanized threaded rod, bolted to the above structure and the Tee support, 36 inches on center.

d. Fasteners: Any exposed fasteners shall be a minimum No.10 size, pin Torx, tamper-proof security screws or blind rivets. Wall anchor bolts shall be 3/8 inch in diameter (Rawl 5015 or equivalent) and shall be placed 16 inches on center. Anchors for securing the wall moldings to the wall shall be furnished by the ceiling manufacturer.

e. Acoustical Material: The inside surface of all perforated ceiling pans shall be covered with a Class “A” poly-encapsulated fiberglass insulation of sufficient thickness and density to provide the acoustical requirements as stated in this Section.

f. Integral Access Doors: All security access doors installed in the metal security ceiling system shall be supplied by the metal security ceiling system manufacturer in locations indicated on the Drawings. Provide a minimum of two access doors per room. Access doors shall have the following characteristics:

1) Size: 24 inches x 24 inches, which fits an opening of 23-3/4 inches x 23-3/4 inches.

2) Door: 12 gauge steel.

3) Frame: 16 gauge steel.

4) Hinge: Full-length semi-concealed piano hinge. Opens 180 degrees.

5) Anchors: Heavy steel, welded to frame.

6) Lock: 1/4-20 theft proof, security bolt, countersunk.

7) Finish: Factory white polyester powder coated paint finish.

g. Lights and HVAC: All light and air units shall be sized to fit into and trim off to full panel width openings and shall be independently supported from above by the trade requiring the opening. Provide factory cut-outs for these items.

h. Finish: All components of the panel and suspension system visible from the floor side shall have a factory applied finish. Prior to painting, all surfaces shall be cleaned of rust, oil and other impurities by receiving a multi-stage pre-treatment consisting of degrease and phosphate coating, clear water rinse and non-chromate sealer and rinse, to condition the surface of the metal to resist and inhibit corrosion and promote paint adhesion. Finish to be applied after perforation to insure coating of the perforated holes. Panels and components shall be coated with DuPont TGIC Polyester or equal, white powder coat, applied at a minimum of 2 mils thickness (dry).

PART 3 EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

A. Protect panels from damage during transit to job storage.

B. Inspect panels upon delivery for damage. Minor damage may be repaired provided finish items are equal in respect to new work and acceptable to Architect. Otherwise, remove and replace with new material.

3.2 INSTALLATION

A. General:

1. Install ceiling system using the approved shop drawings and contract documents. Install using the manufacturer's installation instructions.
2. Accurately locate partitions, holes, cut outs and verify locations with other trades.
3. Set closures and steel supports with anchors to suit condition.
4. Erect true and level with close fitting tolerances.
5. Bearing at ends shall be a minimum of 1 inch.

B. Fastenings

1. Fasten supporting members to each other and to building construction as detailed or as otherwise required to provide a secure, permanent installation.
2. Where fastening spacings and sizes are not shown, use spacings and sizings of bolts, screws and welds which will develop the full strength of the members before failure occurs in the fastenings.

C. Touch-up Painting

1. Immediately after installation, areas where prime or finish coat has been damaged and where welding has occurred shall be sanded smooth and touched up with same primer or finish touch up paint as applied by the manufacturer.
2. Remove rust before touch up primer is applied.

3.3 FIELD QUALITY CONTROL

A. Hold a meeting with other trades to review installation procedures and workmanship with a special emphasis on unusual conditions to ensure correct installation procedures.

B. Security panel system shall be installed in place by qualified personnel, trained and furnished by installer.

END OF SECTION

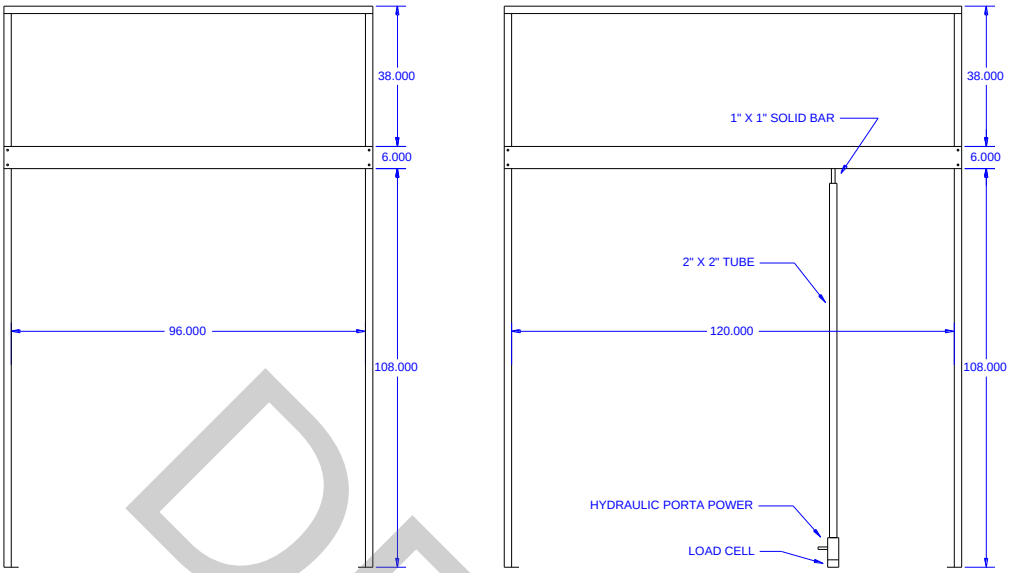


FIGURE 1
Test Assembly Elevation

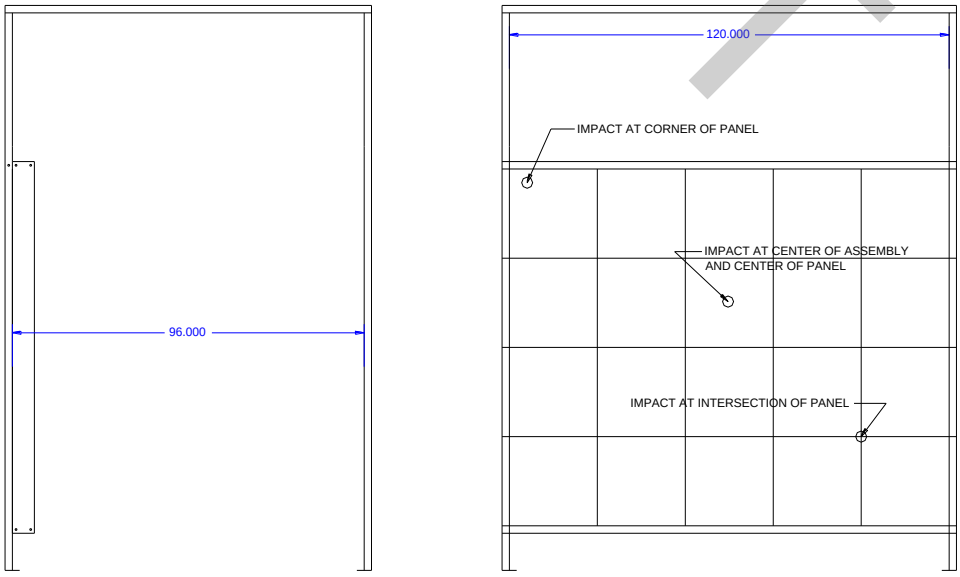


FIGURE 2
Test Assembly Impact Points

SECTION 11 98 36

DETENTION FURNISHINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Dayroom table and seat assemblies.

B. Bunks.

C. Wall mounted mirrors.

D. Recessed shelves.

E. Towel hooks.

F. Anti-Ligature grab bars.

G. Floor benches.

H. Floor mount stools.

I. Wall mount desk.

J. Day room seating

K. Video visitation cabinets.

L. Pistol lockers.

M. Key cabinet.

N. Shower Seats.

O. Soap dispensers.

P. Paper towel dispensers.

Q. Toilet paper roll holders.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 04 22 00 – Concrete Unit Masonry.

C. Section 11 98 00 – Detention Equipment Contractor.

D. Section 11 98 16 – Detention Fasteners.

1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings

C. Indicate fabrication, materials, installation details, finishes, and required anchoring, fasteners, and hardware for each product specified in this Section.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Store in manufacturer's original unopened containers and packaging. Protect from damage. Handle products to prevent damage to products or finishes.

PART 2 PRODUCTS

2.1 DAYROOM TABLE AND SEAT ASSEMBLIES

A. Norix Group, Inc. Max-Master Table Model No. M44200-MAA0WAB-03XX-YYYB four-seat round dayroom tables and seats with game tops.

1. Four Seat Table Top: 42 inch diameter, 45 pound density particle board with permanently embedded T-nuts for securing top to base. Finish shall be Wilsonart Titanium Evolve #4810-60 high pressure plastic laminate with black Slammer Stone radiused edges and Nu-Stone checkerboard inlay game top.
2. Seats: 12 inch diameter, one piece, 14 gauge Type 304 stainless steel with 1-1/2 inch drop edge and stainless steel mounting studs.
    a. Finish: #4 brushed finish.
3. Base: 3 inch diameter, 14 gauge steel tubing with 6 inch x 6 inch x 1/4 inch thick steel mounting plates for top and seats. Provide powder coat paint finish.
4. Installation: Tamper-resistant bolt-down system.
5. Provide Model No. M44200-MAA0WAB-03XX-YYYAZ tables with ADA compliant seating configuration where indicated on Drawings.

2.2 BUNKS

A. Wall Mounted Welded Single Bunks: Norix Group, Inc. Model No. B525-2FW-0006, 76025 inches long x 30 inches wide with welded wall brackets and factory-applied polyester powder coat paint finish, color as selected by Architect.

1. Bed Tray: 12 gauge steel.
2. Wall Brackets:
    a. Material: 7 gauge steel.
    b. Size: 13 inches high x 30.21 inches long with 2 inch mounting flange.

B. Floor Mounted Welded Double Bunks: Norix Group, Inc. Model No. B510-282, 76 inches long x 30 inches wide x 52 inches high with factory-applied polyester powder coat paint finish, color as selected by Architect.

1. Bed Tray: 12 gauge steel.
2. Legs: 2 inch x 2 inch x 3/16 inch steel angle legs with bolt-down floor tabs. Single leg shall be 16 inches high and double leg shall be 52 inches high.

2.3 WALL MOUNTED MIRRORS

A. Norix Group, Inc. Model No. R565-411, wall mounted stainless steel mirror.

1. Overall size: 17-1/4 inches high x 11-1/4 inches wide.
2. Materials: One-piece stamped 18 gauge Type 430 stainless steel with #8 finish; mirror surface highly polished.
3. Provide countersunk holes for tamper resistant stainless steel fasteners.

2.4 RECESSED SHELVES

A. Norix Group, Inc. Model No. S565-550 stainless steel recessed shelf.
   1. Overall Size: 7 inches high x 18 inches wide x 4 inches deep.
   2. Opening Size: 5 inches high x 16 inches wide x 4 inches deep.
   3. Materials: Formed and welded 16 gauge Type 304 stainless steel.
   4. Finishes: #4 finish on exposed surfaces; brushed stainless steel frame; satin interior.
   5. Provide welded anchor nuts at back of shelf to receive threaded studs.

2.5 TOWEL HOOKS

A. Norix Group, Inc. Model No. ITH-110 Front Mount Single Towel Hook with ball style, jam resistant collapsible hook.
   1. Size: 5 inches high x 5 inches wide x 1.20 inches deep.
   2. Backplate: One-piece formed and ground smooth 14 gauge Type 304 stainless steel with brushed finish.
   3. Safety Hooks: Cast and machined Type 304 stainless steel with brushed finish and stainless steel ball and spring.

B. Norix Group, Inc. Model No. ITS-410 4 Strip Front Mount Towel Hook with four ball style, jam resistant collapsible hooks.
   1. Size: 5-1/2 inches high x 18 inches wide x 1.30 inches deep.
   2. Backplate: One-piece formed and ground smooth 14 gauge Type 304 stainless steel with brushed finish.
   3. Safety Hooks: Cast and machined Type 304 stainless steel with brushed finish and stainless steel ball and spring.

C. Norix Group, Inc. Model No. S565-529 4 Strip Front Mount Towel Hook with shelf with four ball style, jam resistant collapsible hooks.
   1. Size: 11 inches high x 18 inches wide.
      a. Depth: 1.13 inches to face of hook, 8 inch shelf depth.
   2. Backplate: One-piece formed and ground smooth 10 gauge Type 304 stainless steel with brushed finish.
   3. Shelf: One-piece formed and ground smooth 14 gauge Type 304 stainless steel with brushed finish..
   4. Safety Hooks: Cast and machined Type 304 stainless steel with brushed finish and stainless steel ball and spring.

2.6 ANTI-LIGATURE GRAB BARS

A. Norix Group, Inc. Model No. IGS-24-3 grab bar, 24 inches long, Model No. IGS-36-3 grab bar, 36 inches long, Model No. IGS-42-3 grab bar, 42 inches long, and Model No. IGS-48-3 grab bar, 48 inches long.
   1. 1-1/2 inch diameter 18 gauge Type 304 stainless steel tube with bent ends passing through and heliarc welded to 11 gauge Type 304 stainless steel wall mounting plates. Each wall mounting plate shall have three anchor holes.
   2. Returns shall provide 1-1/2 inch minimum clearance between wall and bar.
   3. Grab bar shall include a 11 gauge Type 304 stainless steel anti-ligature closure plate welded to grab bar.
   4. Finish: Brushed stainless steel.

2.7 FLOOR BENCHES

A. Norix Group, Inc. Model No. IBF-048 SMU steel floor bench.
   1. Overall Size: IBF accessible transfer benches, 18 inches high x 23 inches deep x 48 inches long.
   2. Materials:
      a. Seating surface: 12 gauge steel.
      b. Legs: 2 inch x 2 inch x 14 gauge steel tube legs with bolt-down floor tabs.
      c. Intermediate Leg Braces: 1.5 inch x 1.5 inch x 14 gauge steel tube welded to legs.
   3. Construction: Fully welded with all welds ground smooth.
   4. Finish: Powder coat paint system.

B. Norix Group, Inc. Model No. IBF-0721818-12CS-003 steel floor bench.
   1. Overall Size: 18 inches high x 18 inches deep x 72 inches long.
   2. Materials:
      a. Seating surface: 12 gauge steel.
      b. Legs: 2 inch x 2 inch x 14 gauge steel tube legs with bolt-down floor tabs.
      c. Intermediate Leg Braces: 1.5 inch x 1.5 inch x 14 gauge steel tube welded to legs.
   3. Construction: Fully welded with all welds ground smooth.
   4. Finish: Powder coat paint system.

2.8 FLOOR MOUNT STOOLS

A. Norix Group, Inc. Model No. S561-120, 12 inch diameter, 14 gauge Type 304 stainless steel seat with #4 finish and 18 inch high, 11 gauge, 2-1/2 inch diameter steel tube post welded to 6 inch x 6 inch x 1/4 inch steel plate with 1/2 inch diameter holes at 4.25 inches on center for floor mounting. Steel components shall receive baked-on epoxy powder coat paint finish.

2.9 WALL MOUNT DESK

A. Norix Group, Inc. Model No. D560-408 Wall hung fully enclosed, tamper-resistant cell desk.
   1. Overall Size: 30 inches wide x 19 inches deep x 10 inches high at wall.
   2. Material: 10 gauge, type 304 stainless steel, #4 finish.

3. Desk shall have integral flange at top and bottom for attachment of unit to wall.
4. Interior of desk shall be filled with fiberglass insulation for sound deadening.

2.10 DAY ROOM SEATING

A. Armless Lounge Chair: Norix Group, Inc. Model No. VA630 Vesta Lounge Armless Chair.
   1. Construction: One-piece, rotationally-molded lightly textured polyethylene with the following properties:
      a. Anti-ligature design with no openings.
      b. Tamper-resistant steel-encased nylon glides.
      c. Molded-in access port with threaded screw cap for ballast weighting capability.
      d. Factory installed bolt-down kit.
   2. Size:
      a. Seat Height: 18.2 inches.
      b. Seat Width: 27 inches.
      c. Overall Height: 33 inches.
      d. Overall Depth: 31.3 inches.
      e. Width: 27 inches.
   3. Chair shall be chemically resistant to acetone, alcohol, blood, vinegar, urine, feces, salt solution, and chlorine solution.
   4. Greenguard Gold certified.
   5. Static Load: Tested to 750 lbs.
   6. Impact resistance: Dynamic drop tested to a relative impact force of two times BIFMA 5.4 15.4.2 (250 lbs. from 18 inches).
   7. Flammability: Meets State of California Technical Bulletin No. 133, Flammability Test Procedure for Seating Furniture for use in Public Occupancies.
   8. Color: As selected by Architect.

2.11 VIDEO VISITATION CABINETS

A. Norix Group Inc., InteleStation Model No. SBW7N wall mounted open style stainless steel cabinets. Provide Model No. SBW9N add-on units.
   1. Materials:
      a. Surface Mount Panel, Divider Panels, and Writing Surface: 12 gauge stainless steel with #4 finish. Writing surface, divider panels, cabinet top, and face plate shall be securely connected with tamper-resistant fasteners.
      b. Wall Mount Bracket: 1/4 inch powder coated steel.
      c. Wall Hanger: 10 gauge powder coated steel.
   2. Size:
      a. Height: 28 inches.
      b. Width: 30.4 inches.
      c. Depth: 13.5 inches.

2.12 PISTOL LOCKERS

A. Norix Group, Inc. Model No. IPL-060 surface mounted and recessed six compartment steel pistol lockers with tilt drawers.
   1. Overall Size: 33-1/2 inches high x 39 inches wide x 6 inches deep.
   2. Materials:
      a. 7 gauge steel at Drawer front plate, drawer, and body shell; cut, formed, welded, and ground smooth.
      b. 10 gauge steel at drawer body, back plate, and strike plate; cut, formed, welded, and ground smooth.
      c. Mounting Flange: 2 inches x 2 inches x 3/16 inch steel.
      d. Hinges: 14 gauge stainless steel continuous piano hinge.
      e. Provide 1/8 inch thick felt lining in drawers.
   3. Locks: One pin tumbler snap lock at each drawer, individually keyed and master keyed.
      a. Provide two keys per compartment and two master keys per locker.
   4. Finish: Shop primed for paint finish.

2.13 KEY CABINET

A. Norix Group, Inc. Model No. IKC-300-A00A surface mounted locking key cabinet to accommodate 300 paracentric and mogul keys.
   1. Material:
      a. Cut, formed, and welded 10 gauge steel panel, shell, and door.
      b. 14 gauge steel racks.
      c. 3/16 inch steel strike plate.
   2. Dimensions: 24 inches high by 16-5/8 inches wide x 7 inches deep.
   3. Hardware:
      f. Hinges: Continuous door hinge with two hinged inside panels.
      g. Locking: Institutional lever tumbler dead bolt with one key.
   4. Finish: Factory primed.

2.14 SHOWER SEATS

A. Viking Products Custom Wall Mounted Shower Seats.
   1. Material: 10 Gauge Type 304 Stainless Steel.
   2. Size: 30 inch W x 16 inch D x 6 inch H at support gusset where seat meets wall. Exposed corner of bench shall have a 1 inch radius, and all sharp edges shall be eased. Seats shall have a 2 inch drop edge.
   3. Fabrication: Welded and ground smooth for seamless appearance.
   4. Mounting: Seats shall be field welded to walls.
   5. Finish: #4 Stainless Steel.

2.15 SOAP DISPENSERS

A. Archer Manufacturing Model No. 1015-01G OPS Vandal Proof Soap Dispenser.
   1. Size: 10-1/8 inch high x 5-1/2 inches wide x 4-3/8 inches deep.
   2. Fabrication: Stainless steel dispenser with circular keyway cam lock.
   3. ADA compliant and ligation resistant.

2.16 PAPER TOWEL DISPENSERS

A. Archer Manufacturing Model No. 1250-01G OPS Vandal Proof Paper Towel Dispenser.
   1. Size: 10 inches high x 10 inches wide x 4.75 inches deep.
   2. Fabrication: Stainless steel dispenser with circular keyway cam lock.
   3. ADA compliant and ligation resistant.
   4. Capacity: 250 sheets.

2.17 TOILET PAPER ROLL HOLDERS

A. CMU Front Mounted: Norix Group, Inc. Model No. ITP-110 wall mounted, recessed toilet paper roll holder.
   1. Material: Type 304 Stainless Steel.
   2. Fabrication: Drawn, 16-gauge one-piece seamless well welded to 14 gauge flange with 0.28 inch diameter holes at corners for attachment of unit to wall.
   3. Dimensions: 7 inch x 7 inch square flange, 5.375 inch opening diameter by 3.4 inch depth.
   4. Finish: Bead blasted satin finish.

PART 3 EXECUTION

3.1 INSTALLATION

A. All products and materials specified in this Section shall be installed according to manufacturer's instructions and as detailed on the Drawings.

3.2 ADJUST AND CLEAN

A. Clean and Touch-up: Remove all packing and protection blemishes and thoroughly clean and polish all finish surfaces. Restore any married or abraded surfaces to their original condition by touching up in accordance with the manufacturer's recommendations. Touch-up shall not obvious.

B. Defective work: Remove and replace all defective work which cannot be properly repaired, cleaned or touched up, as directed by Architect, with no additional cost.

C. Protect installed work during the construction period to prevent abuse and damage.

END OF SECTION

SECTION 12 24 13

ROLLER WINDOW SHADES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electric Motor Operated Roller Window Shades.

B. Shade Fabric.

1.2 RELATED SECTIONS

A. Section 04 22 00 – Concrete Unit Masonry.

B. Section 05 40 00 – Cold-Formed Metal Framing.

C. Section 09 29 00 – Gypsum Board.

D. Section 09 51 13 – Acoustical Panel Ceilings.

E. Division 26 – Electrical.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. CEC – California Electrical Code.
2. NFPA 701 – Standard Methods of Fire Tests for Flame Propogation of Textiles and Films.
3. NFPA 703 – Standard for Fire-Retardant Treated Wood and Fire-Retardant Coatings for Building Materials.
4. UL 325 – ANSI/CAN/UL Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data: Submit manufacturer’s descriptive literature and product specification for each product.

1. Preparation instructions and recommendations.
2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes, and operating instructions.
3. Storage and handling requirements and recommendations.

4. Submit Environmental Certification and Third Party evaluation for Solar Shade Cloth Fabric.
    a. Environmental Certification: Submit written certification from the manufacturer, including third party evaluation, recycling characteristics, and perpetual use certification as specified below. Materials that are PVC-free without identifying their inputs shall not qualify as meeting the intent of this specification.
    b. Third Party Evaluation: Provide documentation stating the shade cloth has undergone third party evaluation for all chemical inputs, down to a scale of 100 parts per million, and have been evaluated for human and environmental safety. Identify any and all inputs which are known to be carcinogenic, mutagenic, teratogenic, reproductively toxic, or endocrine disrupting. Identify items that are toxic to aquatic systems, contain heavy metals, or organohalogens. The material shall contain no inputs that are known problems to human or environmental health per the above major criteria, except for an input that is required to meet applicable fire codes and regulations.
    c. Recycling Characteristics: Provide documentation that the shade cloth is part of a closed loop of perpetual use and not be required to be down-cycled, incinerated, or otherwise disposed of. Scrap material shall be capable of being sent back to the mill for reprocessing and recycling into the same quality yarn and woven into new material without down-cycling. Certify that this process is currently available and will be utilized for this project.
    d. Perpetual Use Certification: Certify that at the end of the useful life of the shade cloth that the material can be sent back to the manufacturer for recapture as part of a closed loop of perpetual use and that the material can and will be reconstituted into new yard for weaving into new shade cloth. Provide information on each shade band indicating that the shade band can be sent back to the manufacturer for this purpose.

C. Shop Drawings:
    1. Provide plans, elevations, sections, product details, installation details, operational clearances, and relationship to adjacent work.
    2. Provide window treatment schedule for all roller shades. Use same room designations as indicated on Drawings and include opening sizes and key to typical mounting details.
    3. Provide wiring diagrams including integration of motors with applicable building control systems.

D. Samples:
    1. Selection of metal component finishes.
    2. Selection of shade fabric colors, weaves, and types.

E. Manufacturer’s Operation and Maintenance Instructions: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, and instructions for operating hardware and controls.

1.5 QUALITY ASSURANCE

A. Qualifications
    1. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of ten years’ experience in manufacturing products comparable to those specified in this Section.

2. Supplier Qualifications: The manufacturer or its subsidiary or licensed agent approved to supply products of this Section and honor any claims against the product presented in accordance with the warranty.
3. Installer Qualifications: Firm specializing in installing work specified in this Section acceptable to manufacturer with documented experience on at least five projects of similar nature in past three years.

B. Electrical components shall be labeled by UL, ETL, or other testing agency acceptable to Authority Having Jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing.

C. Requirements for Electronic Hardware, Controls, and Switches: Roller shade hardware, shade fabric, EDU, and all related controls shall be furnished and installed as a complete two-way communicating system and assembly.

D. Field Samples: Provide large size sample of selected fabric for final verification of color, weave, and density.

E. Pre-Installation Meetings:
1. Conduct pre-installation meeting in accordance with provisions of Division 01.
2. Convene pre-installation meeting one week prior to commencing work of this Section.
3. Coordinate work in this Section with work in related Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products when all concrete, masonry, plaster, painting, and other wet work has been completed and dried.

C. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

D. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings.

E. Store materials in a dry secure place. Protect from weather, surface contaminants, corrosion, construction traffic, and other potential damage.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Solar shade cloth fabric shall be PVC-free.

1.8 PROJECT CONDITIONS

A. Maintain ambient temperature between 60 degrees F and 85 degrees F and relative humidity between twenty percent and fifty percent 24 hours before installation and maintain until Owner’s final acceptance.

B. Condition products at designated work areas 24 hours before installation.

C. Power and control wiring shall be complete and certified, fully operational with uninterrupted communication on the lines and minimal noise certified by a third party. Noise on the line shall not exceed shade manufacturer's limits.

1.9 WARRANTY

A. Comply with provisions of Division 01.

B. Warrant installed units to be free from defects in material and workmanship as follows:

1. TPO Solar Shadecloth: Manufacturer's standard non-depreciating ten year limited warranty.
2. Roller Shade Motors and Motor Control Systems: Manufacturer's standard non-depreciating five-year warranty.
3. Roller Shade Installation: One year.

C. In the event a warranted product or component fails, facilitate materials replacement at no cost to the Owner under the provisions of Division 01.

1.10 MAINTENANCE

A. Operations and Maintenance Data:

1. Comply with requirements of Division 01.
2. Include operation and cleaning information.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Mecho, Long Island City, NY; phone: 718.729.2020, URL: http://www.mechoshade.com.
2. Hunter Douglas Architectural, Poway, CA, phone: 800.727.8953, URL: http://www.hunterdouglasarchitectural.com.
3. Draper, Inc., Spiceland, IN; phone: 800-238-7999, URL: http://www.draperinc.com.

B. Substitutions: Under provisions of Division 01.

2.2 MOTOR OPERATED WINDOW SHADES

A. Manufacturers and Products:

1. Mecho. Product: ElectroShade Electro/2 with WhisperShade iQ2-DC Drive Unit.
2. Hunter Douglas Architectural.
3. Draper, Inc.
4. Substitutions: Under provisions of Division 01.

B. Roller Tube:

1. Extruded aluminum alloy roller tube.
2. Diameter: Sufficient diameter and thickness to support shade fabric without excessive deflection. Minimum 2.50 inch diameter for widths up to 120 inches.

C. Motorized Shade Hardware and Shade Brackets:

1. Provide brackets for mounting conditions indicated on Drawings.
2. Provide shade hardware constructed of minimum 12 gauge, 0.105 inch thick plated steel, or heavier, as required to support 200 percent of the motor stall torque Plastic components without use of steel angle construction do not meet the intent of this Section and shall not be accepted.
3. Provide shade hardware system that allows for field adjustment of EDU or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside or outside mount).
4. Provide shade hardware system that allows for operation of multiple shade bands offset by a maximum of 16 degrees to 45 degrees from the EDU axis between shade bands (8 degrees to 22.5 degrees) on each side of the radial line, by a single shade EDU (multi-banded shade, subject to manufacturer's design criteria).
5. All bands within a single EDU group shall be aligned within 1/4 inch.

D. Motors:

1. UL listed asynchronous capacitor start and run with built-in thermal overload protection and limit switch adjustments.
2. Addressable 'intelligent' motors capable of up to eight group (zone) assignments without the need for additional outboard shade controllers.
3. Quiet operation: Less than 46bd in 3 feet of open air, across all lift capacities necessary for project.
4. 24 volt DC motor.
   a. Switches shall operate at 24 Volts.
5. Motors shall be totally enclosed within the roller tube.
6. Motors must include built-in dry-contact interface capabilities.
7. Total hanging weight of shade fabric shall not exceed 80 percent of motor's lifting capacity.

2.3 WALL SWITCHES

A. Wired Wall Switches: Shades shall be operated by 2, 4, 5, 7, or 10-button low voltage standard switches. Standard switch shall be wired to a network interface and be programmed to transmit an address for the local switch. An address that is transmitted by either a switch or central controller shall be responded to by those EDU's with the same address in their control table. Standard switch may control an individual, sub-group or group of EDU's in accordance with the address in each EDU.

2.4 SHADE FABRIC

A. Manufacturers and Products:

1. MechoShade, Product: EcoVeil 1350 Series, 100 percent thermoplastic olefin, 2 x 2 basketweave pattern with 5 percent openness factor.
2. Hunter Douglas Architectural, Product: Phifer SheerWeave Infinity 2 5%.
3. Draper Inc., Product: Phifer SheerWeave Infinty2 5%.
4. Substitutions: Under provisions of Division 01.

B. Visually transparent non-raveling shade fabric.

C. Shade fabric shall be PVC-free. All fabrics shall be TPO based; 'PVC-free' alone will not qualify for consideration.

D. Characteristics:

1. Meet or exceed requirements of NFPA 701 and Title 19 CCR Division 1, Chapter 8.
2. Content: 100 percent thermoplastic olefin (TPO).
3. Mesh Weight: 12.68 ounces per square yard.
4. Fabric Thickness: 0.034 inch.
5. Openness Factor: 5 percent.
6. Washable, colorfast and fade resistant.
7. Color: As indicated on Drawings.

2.5 SHADE BANDS

A. Shade Bands: Construction of shade band includes the fabric, the enclosed hem weight, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets shall not be acceptable.

1. Hembar: Universal exposed hembar.
2. Shade Band and Shade Roller Attachment:
   a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection.
   b. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" Spline mounting, without having to remove shade roller from shade brackets or insert shadeband from the side.
   c. Mounting Spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets, does not meet the performance requirements of this Section and will not be accepted.

2.6 ACCESSORIES

A. Fascia:

1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
2. Fascia shall be able to be installed across two or more shade bands in one piece.
3. Fascia shall fully conceal brackets, shade roller, and fabric on the tube.
4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
5. Fascia shall include a channel for application of flexible material (shlegel) to closing off any light leakage between the fascia and a window frame, mullion, ceiling and/or any other horizontal surface.
6. Fascia shall attach directly to the roller shade bracket without the need to install additional mounting hardware. Exposed fasteners shall not be allowed.
7. Fascia shall positively lock in a top-down installation method.

2.7 FINISHES

A. Extruded Aluminum (panels, fascias, covers, bars, and channels):

1. Standard baked enamel paint finish. Colors selected by Architect from manufacturer's full range of standard colors.

B. Shade Fabric: Type and color as selected by the Architect from samples submitted.

2.8 FABRICATION

A. Take accurate field measurements to verify required dimensions prior to fabrication.

B. Fabricate fabric to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or reveling.

C. Fabricate unguided fabric to roll true and straight without shifting sideways more than 1/8 inch in either direction for every eight feet of shade height due to warp distortion or weave design.

D. Fabricate with bottom hem weights as needed or exposed hem bar with light seal as applicable.

E. Railroading of solar fabrics will not be allowed, except by permission of the Architect during submittal phase.

F. Provide battens in standard shades as required to assure proper tracking and uniform rolling of fabric.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate conditions and dimensions. Verify if substrate is ready and acceptable to receive window shade system.

B. Confirm that blocking for roller shades is installed plumb, level, and fitted to window mullion as per Contract Documents and in accordance with industry standard tolerances.

C. Report unacceptable conditions to the Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 INSTALLATION

A. Install in accordance with manufacturer's printed instructions and accepted shop drawings.

B. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow proper clearances for window operation hardware.

C. Adjust, align and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

D. Motor Operated Window Shades:

1. Install control systems in accordance with manufacturer's recommendations and accepted submittals.

2. Make low voltage electrical control connections as required. All line and low voltage wire runs and line voltage terminations shall be made by a licensed electrician and will be the responsibility of Division 26 contractors. Shade contractor shall provide all wiring diagrams.
3. All power and controls cabling shall be concealed.
4. Set upper, lower and up to three intermediate stop positions of all motorized shade bands, and assure alignment in accordance with the above requirements.
5. Test and certify the operation of all motorized shades.

E. Installation Tolerances:

1. Maximum variation of gap at window opening perimeter: 1/4 inch per 8 feet of shade height.
2. Maximum offset from level: 1/16 inch per 20 feet of shade width.

3.3 ADJUSTING

A. Adjust parts for smooth, uniform operation.

B. Adjust shade assembly and fabric to hang flat without buckling and distortion.

C. Replace any units or components, which do not hang properly or operate smoothly at no additional cost to Owner.

3.4 CLEANING

A. Clean exposed surfaces, including metal and fabric using non-abrasive materials and methods as recommended by manufacturer.

B. Do not use materials or methods, which may damage finish or surrounding construction.

C. Remove and replace work which cannot be satisfactorily cleaned at no additional cost to Owner.

END OF SECTION

SECTION 12 93 00

SITE FURNISHINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Bike Rack

B. Bike Locker

C. Flagpole

1.02 RELATED SECTIONS

A. Section 32 13 13 – Concrete Sidewalk: Coordination of anchor placements and layout.

B. Section 03 30 00 – Cast-in-Place Concrete: footing for flagpole.

1.03 MEASUREMENT AND PAYMENT

A. Payment of the various Construction Items described in the Schedule of Values shall be considered full compensation for work of this Section.

1.04 REFERENCES

A. ASTM A48 / A48M -03(2008) Standard Specification for Gray Iron Castings

B. ASTM A356 / A356M -07 Standard Specification for Steel Castings

C. ASTM A536 -84(2004) Standard Specification for Ductile Iron Castings

1.05 SUBMITTALS

A. Product Data: Submit product data for each specified item.

B. Shop Drawings: Submit manufacturer's installation shop drawings for each specified item.

C. Color Samples: Submit manufacturer's color samples for each color specified. Final color selection shall be based on these samples.

D. Samples: Submit samples as specified.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Madrax, 1080 Uniek Drive, Waunakee, WI 53597, (800) 448-7931, www.madrax.com.

B. Concord Industries, 4150-A Kellway Circle, Addison, TX 75001, 800-527-3902, www.concordindustries.com

2.02 MANUFACTURED PRODUCTS

A. Bike Locker: As specified in the plans.

B. Bike Rack: As specified in the plans.

C. Flagpole: As specified in the plans.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine site and verify lines, grades, and other work and verify that areas are ready to receive installations.

3.02 INSTALLATION -GENERAL

A. Coordinate with paving and other affected Work.

B. Complete assembly of furnishing, where required.

C. Install in accordance with manufacturer's shop drawings and recommendations.

D. Install square to lines indicated on the Drawings and plumb to vertical.

E. Unless otherwise indicated, install furnishings after landscaping and paving have been completed.

3.03 FLAGPOLE

A. Comply with manufacturer's printed instructions.

B. Locate so that pole and lighting are outside of path of pedestrian travel.

3.04 CLEANING AND PROTECTION

A. Clean work in accordance with manufacturer's recommendations.

B. Protect work against damage until final acceptance. Replace or repair to the satisfaction of the Architect any work that becomes damaged prior to final acceptance.

END OF SECTION

ARCHITECTURE
ENGINEERING
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INTERIORS
SUSTAINABILITY
GRAPHICS

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PROJECT MANUAL FOR

MONO COUNTY PUBLIC WORKS DEPARTMENT

MONO COUNTY NEW JAIL

NEW CONSTRUCTION

PW: _____

BSCC # _____

OSFM # _____

LIONAKIS NO. 018133

OSFM Submittal Specifications
VOLUME 3 of 3

September 11, 2023

FOR OSFM USE ONLY

PROJECT MANUAL

FOR

MONO COUNTY PUBLIC WORKS DEPARTMENT
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SECTION 21 00 50

BASIC FIRE SPRINKLER MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electric motors.
2. Motor starters.
3. Valve Boxes.
4. Access doors.
5. Expansion loops.
6. Insulation.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. This Section is part of each Division 21 Section.

1.3 ADDITIONAL REQUIREMENTS

A. Furnish and install incidental work not shown or specified necessary to provide a complete and workable system.

B. Make temporary connections required to maintain services during the course of the Contract without additional cost to Owner. Notify Owner seven days in advance before interrupting services.

1.4 REFERENCES AND STANDARDS

A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at time of bid shall be used.

1. ANSI - American National Standards Institute.
2. ASTM - American Society for Testing and Materials.
3. CCR - California Code of Regulations.

a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36.

4. NCPWB - National Certified Pipe Welding Bureau.
5. CEC - California Electrical Code.
6. NEMA - National Electrical Manufacturers' Association.

7. NFPA - National Fire Protection Association, as amended by the CBC.
8. OSHA - Occupational Safety and Health Act.
9. UL - Underwriters' Laboratories, Inc.

B. Requirements of Regulatory Agencies:

1. The publications listed below form part of this Specification. Comply with provisions of these publications except as otherwise shown or specified.
   a. California Building Code, 2022.
   b. California Electrical Code, 2022.
   c. California Energy Code, 2022.
   d. California Fire Code, 2022.
   e. California Green Building Standards Code, 2022.
   f. California Mechanical Code, 2022.
   g. California Plumbing Code, 2022.
   h. California Code of Regulations, Title 24.
   i. California Health and Safety Code.
   j. CAL-OSHA.
   k. California State Fire Marshal, Title 19 CCR.
   l. DSA - Division of the State Architect. Interpretive Regulations (IR's).
   m. National Fire Protection Association, as amended by the CBC.
   n. Occupational Safety and Health Administration.
   o. Other applicable state laws.

2. Nothing in Drawings or Specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or Specifications to repeat requirements of codes except where necessary for clarity.

1.5 DRAWINGS

A. Examine Contract Documents prior to bidding of Work and report discrepancies in writing to Architect.

B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The fire protection Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.

1. Architectural and structural Drawings are part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over fire protection Drawings.
2. Because of the small scale of fire protection Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in locations shown. Obtain Architects' approval prior to relocation of equipment and materials.

3. Relocate equipment and materials installed without prior approval of Architect. Remove and relocate equipment and materials at Contactors' expense upon Architects' direction.
4. Minor changes in locations of equipment, piping, ducts, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.

C. Execute work mentioned in Specifications and not shown on Drawings, or vice versa, the same as if specifically mentioned or shown in both.

1.6 FEES AND PERMITS

A. Obtain and pay for permits and service required in installation of the Work. Arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with the requirements of Division 1.

B. Arrange for utility connections and pay charges incurred, including excess service charges.

1. Bear the cost of construction related to utility services, from point of connection to utility services shown on Contract Documents. This includes piping, excavation, backfill, meters, boxes, check valves, backflow prevention devices, general service valves, concrete work, and the like, whether or not Work is performed by Contractor, local water/sanitation district, public utility, other governmental agencies or agencies' assigns.

1.7 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. General:

a. Coordinate Work in this Section with trades covered in other Specification Sections to provide a complete and operable installation of highest quality workmanship.

2. Electrical Coordination:

a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified in this Section. Contractor has full responsibility for the following items of work:

1) Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
2) If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source,

include cost to furnish and install additional electrical services as part of bid.

3) Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.

3. Mechanical Coordination:

a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during progress of construction.
c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section “Access Doors and Frames.”

1.8 SUBMITTALS

A. Refer to Division 01 Submittals Section(s) for additional requirements.

B. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.

1. Partial or incomplete submittals will not be reviewed.
2. Quantities are Contractor's responsibility and will not be reviewed.
3. Provide materials of same brand or manufacturer for each class of equipment or material.
4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
5. Identify each submittal item by reference to items’ Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.
6. Organize submittals in same sequence as in Specification Sections.
7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.

a. Submit shop drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as

instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.

d. Catalog cuts and published material may be included with supplemental scaled drawings.

C. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.

D. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect shop drawings or submittals on all items of equipment and materials provided. Provide submittal in at least seven copies and in complete package.

1. Shop drawings and submittals shall include Specification Section, Paragraph number, and Contract Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from Contract Documents shall be clearly identified and appear at the beginning of submittal package, and shall be referenced to applicable Contract Documents requirements.

E. Provide layouts for fire protection systems, for inclusion in coordinated layout specified in Section 23 80 00. Comply with requirements for layouts specified in Section 23 80 00.

1.9 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for fire protection systems materials and products.

B. Shop Drawings.

C. Provide product data for insulation products, including insulation, insulation facings, jackets, adhesives, sealants, and coatings, indicating compliance with requirement that these products contain less than 0.1 percent (by mass) polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations.

D. Product Data for California Green Building Standards Code Compliance: For adhesives and sealants, including primers, documentation of compliance including printed statement of VOC content and chemical components.

E. Delegated-Design Submittal: For seismic supports, anchorages, and restraints indicated to comply with performance requirements and design criteria.

1. Calculations performed for use in selection of seismic supports, anchorages, and seismic restraints shall utilize criteria indicated in Structural Contract Documents.
2. Supports, anchorage and restraints for piping and equipment shall be an OSHPD pre-approved system such as Tolco, ISAT, Mason, or equal. Pipes and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code and NFPA 13. System shall have current OPA number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.

    a. Bracing of Piping and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation.

3. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, equipment, and restraint locations, and detailing supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with California Building Code and NFPA 13.
4. Additional Requirements: In addition to the above, conform to State and local requirements.

1.10 INFORMATIONAL SUBMITTALS

A. Provide coordination drawings for fire protection systems in accordance with the requirements of Specification Section 21 10 00.

B. Furnish to Project Inspector complete installation instructions on material and equipment before starting installation.

1.11 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Refer to Division 01 for complete instructions.
2. Furnish three complete sets of Operating and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operating and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Start compiling data upon approval of submittals.

    a. Sets shall incorporate the following:

1) Product Data.
2) Shop Drawings.
3) Record Drawings.
4) Service telephone number, address and contact person for each category of equipment or system.
5) Complete operating instructions for each item of fire sprinkler system.

    a) Original manual of NFPA-25 for fire sprinkler system.

6) Copies of guarantees/warrantees for each item of equipment or systems.
7) Test data as specified.
8) Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
9) Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
10) A complete list or schedule of scheduled valves giving the number of the valve, location and the rooms or area controlled by the valve. Identify each valve with a permanently attached metal tag stamped with number to match schedule. Post list in frame under plastic on wall in mechanical room or where directed by Architect.
11) Check test and start reports for each piece of fire protection equipment provided as part of the Work.
12) Commissioning and Preliminary Operation Tests required as part of the Work.

b. Post service telephone numbers and addresses in an appropriate place designated by Architect.

B. Record Drawings:

1. Refer to Division 01, Record Documents, for requirements governing Work specified herein.
2. Upon completion of the work, deliver to Architect the following:

    a. Originals of drawings showing the Work exactly as installed.
    b. One complete set of reproducible drawings showing the Work exactly as installed.
    c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
    d. Provide Contractor’s signature, verifying accuracy of record drawings.
    e. Obtain the signature of the Project Inspector for all record drawings.

1.12 SUBSTITUTIONS

A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In case of conflict between requirements given in this Section and those of Division 01, Division 01 requirements shall apply.

B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.

C. Substitutions will be interpreted to be manufacturers other than those specifically listed in Contract Documents by brand name, model, or catalog number.

D. Only one request for substitution will be considered for each item of equipment or material.

E. Substitution requests shall include the following:

1. Reason for substitution request.
2. Complete submittal information as described herein; see “Submittals.”
3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
5. Explanation of impact on connected utilities.
6. Explanation of impact on structural supports.

F. Installation of reviewed substitution is Contractors’ responsibility. Any mechanical, electrical, structural, or other changes required for installation of substituted equipment or material must be made by Contractor without additional cost to Owner. Review by Architect of substituted equipment or material will not waive these requirements.

G. Contractor may be required to compensate Architect for costs related to substituted equipment or material.

1.13 DELIVERY, STORAGE AND HANDLING

A. Protect equipment and materials delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

1.14 FIELD CONDITIONS

A. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by Architect and shall be made without additional cost to Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify Architect if services are found which are not shown on Drawings.

1.15 WARRANTY

A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor’s Standard Guarantee.

B. Repair or replace defective work, material, or part that appears within warranty period, including damage caused by leaks.

C. On failure to comply with warranty requirements within a reasonable length of time after notification is given, Architect/Owner shall have repairs made at Contractor's expense.

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.

B. All sizes, capacities, and efficiency ratings shown are minimum.

C. Refer to Section 21 10 00 for specific system piping materials.

2.2 MATERIALS

A. No material installed as part of this Work shall contain asbestos.

B. California Green Building Code Compliance:

1. Fire protection equipment shall not contain CFCs.
2. Fire protection equipment shall not contain Halons.

2.3 ELECTRIC MOTORS

A. U.S. Motors, Century Electric, General Electric, Lincoln, Gould or equal. Minimum efficiencies shall be as defined by IEEE 112 Test Method B and NEMA MG1. Provide NEMA 3R enclosure where exposed to outdoors.

2.4 MOTOR STARTERS

A. Square D, Allen Bradley, or equal, in NEMA Type 1 enclosure, unless otherwise specified or required. Minimum starter size shall be Size 1. Provide NEMA 3R enclosure where exposed to outdoors.

B. Where three phase motors are provided for two-speed operation, provide two speed motor starters.

1. All three-phase starters shall have the following:

a. Provide magnetic motor starters for equipment provided under the fire protection Work. Starters shall be non-combination type. Provide part winding or reduced voltage start motors where shown or as hereinafter specified. Minimum size starter shall be Size 1.
b. Cover mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.
c. Three ambient compensated thermal overload.
d. Fused control transformer (for 120 or 24 volt service).

e. Pilot lights, integral with starters. Starters located outdoors shall be installed in NEMA IIIR enclosures.

2.5 VALVE BOXES

A. General:

1. Where several valves or other equipment are grouped together, provide larger boxes of rectangular “vault” type adequately sized for condition and similar in construction to those specified above.
2. Provide valve box extensions as required to set bottom of valve box tight up to top of piping in which valve is installed.
3. Provide a tee handle wrench for each size, Alhambra Foundry Co. #A-3008, or equal.

B. Valve Boxes in Traffic Areas: Provide Christy No. G5 traffic valve box, Brooks, or equal, 10-3/8 inches inside diameter with extensions to suit conditions, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves.

C. Valve Boxes in Non-Traffic Areas: Provide Christy No. F22, Brooks, or equal, 8 inches inside diameter by 30 inches long, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves. Cut bottom of plastic body for operation of valves.

D. Valve Box (Rectangular Vault Type): Precast concrete or cast iron with cast iron or steel locking type covers lettered to suit service – Brooks No. 3-TL, Christy No. B3, Fraser No. 3, Alhambra A-3004 or A-3005, Alhambra E-2202, or E-2702, or equal, with extension to suit conditions.

2.6 ACCESS DOORS

A. Where floors, walls, or ceilings must be penetrated for access to fire protection equipment or devices, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.

1. Access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.

B. Access doors shall match those supplied in Division 08, except as noted in this Section.

C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for other areas.

D. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with Architect when access is required in these areas.

E. Where specific information or details relating to access panels different from the above is shown or given on Drawings or other Divisions of work, that information shall supersede this specification.

F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:

1. Milcor:

a. Style K (plaster).
b. Style DW (gypsum board).
c. Style M (masonry).
d. Style "Fire Rated" where required.

2.7 EXPANSION LOOPS

A. Manufactured assembly consisting of inlet and outlet elbow fittings, two sections of flexible metal hose and braid, and 180-degree return bend or center section of flexible hose. Flexible hose shall consist of corrugated metal inner hose and braided outer sheath. Provide UL listed assembly selected for 4 inches of movement.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

Metraflex Inc., Fireloop series.
Unisource Manufacturing, Inc., V series.

2.8 EQUIPMENT IDENTIFICATION

A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

B. Text of Signs: Provide identification of equipment unit number, and room or area served. Coordinate name of area served with final room names and numbers for the facility. In addition, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

2.9 PIPE IDENTIFICATION

A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.

B. The legends and flow arrows shall conform to ASME A13.1.

2.10 INSULATION WORK

A. General:

1. Adhesives shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
2. The term "piping" used herein includes pipe, valves and fittings.

a. Apply insulating cement to fittings, valves and strainers and trowel smooth to equal the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to bonnet. Leave strainer cleanout plugs accessible.
b. Provide pre-formed PVC valve and fitting covers.
c. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.

3. Test insulation, jackets, and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723, ASTM E84, or NFPA 255.
4. Clean thoroughly, test and have approved, piping and equipment before installing insulation and/or covering.
5. Repair damage to existing pipe insulation whether or not caused during Work of the Contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.

B. Insulation of Piping:

1. Insulate fire protection piping located outside building exposed to weather with minimum 3-1/2 pounds per cubic foot density fiberglass with ASJ-SSL jacket. Insulation thickness for all pipe sizes: 2 inches.
2. Where insulated piping is exposed to the weather apply aluminum jacket secured with 1/2-inch stainless-steel bands on 12-inch centers. Insulation shall be vapor tight before applying metal jacket, and aluminum fitting covers. Install jacketing with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Cover fittings with glass cloth, two coats of Foster Sealfas 30-36, and factory-fabricated aluminum fitting covers, of same material, finish, and thickness as jacket. Insulation shall be vapor tight before applying metal jacket and fitting covers.

a. Fitting covers:

1) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
2) Tee covers.
3) Flange and union covers.
4) End caps.

5) Beveled collars.
6) Valve covers.
7) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

b. Pipes 10 inches diameter and smaller: Minimum .016 inch thick jacket.
c. Pipes 12 inches diameter and larger: Minimum .020 inch thick jacket.

PART 3 - EXECUTION

3.1 FRAMING, CUTTING AND PATCHING

A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.

B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.

C. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.

D. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

3.2 ELECTRICAL REQUIREMENTS

A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the fire protection Work with the electrical Work to comply.

B. Furnish necessary control diagrams and instructions for controls. Before permitting operation of equipment which is furnished, installed, or modified under this Section, Contractor shall review associated electrical work, including overload protection devices, and assume complete responsibility for correctness of electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. Equipment and connections exposed to weather shall be installed in NEMA IIIR enclosures with factory wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.

C. All line voltage and low voltage wiring and conduit associated with fire protection system are included in this Section. Wiring and conduit shall comply with Division 26.

D. Electric Motors:

1. Motors shall be rated for continuous operation at 115% of nameplate amperage but shall be selected to operate at less than nameplate amperage throughout

entire operating cycle. Motors found to exceed nameplate amperage shall be promptly replaced at no cost to Owner. Horsepower shown is minimum and shall be increased as necessary to comply with above requirements. Furnish motors with splash-proof or weatherproof housings, where required or recommended by motor manufacturer. Match the nameplate voltage rating with electrical service supplied. Check electrical Drawings. Provide transformer for each motor not wound specifically for system voltage.

E. Motor Starters:

1. Provide magnetic motor starters for equipment provided under the fire protection Work. Starters shall be non-combination type. Provide part-winding or reduced voltage start motors on motors 50 – HP and larger, or where shown or as hereinafter specified. Minimum size starter shall be Size 1. Three-phase starters shall have the following:

   a. Cover-mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.
   b. Three ambient compensated thermal overload.
   c. Fused control transformer (for 120 or 24 volt service).
   d. Pilot lights, integral with the starters. Starters located outdoors shall be in NEMA IIIR enclosures.

2. Starters for single-phase motors shall have thermal overloads, Westinghouse Type MSTOLSLIP, Square D, or equal, toggle-operated with pilot light, NEMA I enclosure for starters located indoors, NEMA IIIR enclosure for starters located outdoors.
3. Provide OSHA label indicating that the device starts automatically.

3.3 PIPING SYSTEM REQUIREMENTS

A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

3.4 PRIMING AND PAINTING

A. Perform priming and painting on the equipment and materials as specified herein.

B. See Division 09 Painting Section(s) for detailed requirements.

C. Priming and Painting:

1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.

   a. Black Steel Piping:

1) Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.
2) Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.

2. Metal surfaces of items to be jacketed or insulated except piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the highest grade zinc rich primer. After erection or installation, primed surfaces shall be properly cleaned of foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Abrasion or other damage to shop or field prime coat shall be properly repaired and touched up with same material used for original priming.
3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

3.5 EXCAVATING

A. Perform excavating required for Work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.

B. Unless shown otherwise, provide 3 foot minimum cover for fire piping, or 1 foot below frost line, whichever results in deepest installation. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For PVC pipe, bed pipe in 4 inch deep minimum sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. Other materials should have minimum sand equivalent of 50. Only a small proportion of native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such that less than 100 percent will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.

C. Maintain warning signs, barricades, flares, and red lanterns as required.

D. For trenches 5 feet or more in depth, submit copy of permit, and detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from hazard of caving ground during excavation of such trenches. Obtain a permit from Division of Industrial Safety prior to beginning excavations. A copy of permit shall be available at the Project site.

3.6 BACKFILLING

A. Backfill shall comply with applicable provisions of Division 31 of these Specifications.

B. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.

1. Backfill plastic pipe and insulated pipe with sand for minimum distance of 12 inches above the top of pipe. Compact using mechanical tamping equipment.

C. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase minimum compaction within uppermost two feet of backfill to 95 percent.

D. Replace or repair to its original condition sod, concrete, asphalt paving, or other materials disturbed by trenching operation. Repair within warranty period.

E. Thrust Blocks:

1. Provide concrete anchors or thrust blocks on PVC and cast iron water lines installed underground. Install thrust blocks at changes in direction and at connections to mains 1-1/2 inches and larger. Form thrust blocks by pouring concrete between pipes and trench wall. Thrust blocks shall be adequate in size and placed to take thrusts created by the maximum internal water pressure; sizing and placement shall be per manufacturer's recommendations and in accordance with requirements of NFPA 24.
2. Anchor piping to building construction.

3.7 PIPING SYSTEMS INSTALLATION

A. At time of final connection, and prior to opening valve to allow pressurization of water piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on fire protection piping is greater than 175 psi, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.

B. General:

1. Piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.
2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.
3. Install piping to permit application of insulation where required and to allow valve servicing.

4. Where piping or conduit is left exposed within a room, the piping or conduit shall be run true to vertical, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
5. Horizontal runs of pipes and/or electrical conduit suspended from ceilings shall provide for maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from Architect.
6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.
7. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.
8. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
9. Install horizontal valves with valve stem above horizontal.
10. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
11. Verify final equipment locations for roughing-in.
12. Service Markers: Mark location of each plugged or capped pipe with 4 inch round by 30 inch long concrete marker, set flush with finished grade. Provide 2-1/2 inch diameter engraved brass plate as part of service marker.
13. Where piping is installed in walls within one inch of face of stud, provide 16 gauge sheet metal shield plate on face of stud. The shield plate shall extend minimum 1-1/2 inches beyond outside diameter of pipe.

C. Expansion Loops:

1. Install expansion loops where piping crosses building expansion or seismic joints, between buildings, between buildings and canopies, and as indicated on Drawings.
2. Install expansion loops of sizes matching sizes of connected piping.
3. Install grooved-joint expansion joints to grooved-end steel piping.
4. Materials of construction and end fitting type shall be consistent with pipe material and type of gas or liquid conveyed by piping system in which expansion loop is installed.

D. Sleeves:

1. Install Adjus-to-Crete, Pipeline Seal and Insulator, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations, as directed, shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.
2. At Contractor's option, Link-Seal, Metraflex Metraseal, or equal, casing seals may be used in lieu of caulking. Wrap pipes through slabs on grade with 1 inch thick fiberglass insulation to completely isolate pipe from concrete.

E. Floor, Wall, and Ceiling Plates:

1. Fit pipes, with or without insulation, passing through walls, floors, or ceilings, and hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.

F. Firestopping:

1. Pack annular space between pipe sleeves and pipe through floors and walls with UL listed fire stop, and seal at ends. Pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.

    a. Install fire caulking behind fire protection services installed within fire rated walls, to maintain continuous rating of wall construction.

2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators, or equal, for each pipe penetration or fixture opening passing through floors, walls, partitions or floor/ceiling assemblies. Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and with Chapter 7, CBC requirements.
3. Sleeve penetrators shall have built in anchor ring for waterproofing and anchoring into concrete pours or use special fit cored hole penetrator for cored holes.
4. Copper and steel piping shall have SpecSeal plugs, or equal on both sides of penetrator to reduce noise and to provide waterproofing.
5. All above systems to be installed in strict accordance with manufacturer's instructions.
6. Alternate firestopping systems are acceptable if approved as equal. Contractor is responsible for determining suitability of alternate products for their intended use, and shall assume all risks and liabilities in connection with the use of alternate products.

G. Flashing:

1. Flashing for penetrations of metal or membrane roof for fire protection items shall be coordinated with roofing manufacturer and roofing installer for specific roofing type utilized. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for fire protection work.

    a. Furnish and install flashing and counterflashing in strict conformance with requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
    b. Furnish and install counterflashing above each flashing required. Elmdor/Stoneman Model 1540, or equal.

2. For other types of roofing systems, furnish and install around each pipe, where pipe passes through roof, a flashing and counterflashing. Flashing shall be made of four pound seamless sheet lead with 6 inch minimum skirt and steel reinforced boot. Counterflashing shall be cast iron. Elmdor/Stoneman Model 1100-4, or equal.

H. Hangers and Supports:

1. General: Support equipment and piping so that it is firmly held in place by approved iron hangers and supports and special hangers as required. Hangers and supports shall be UL listed for fire protection service. Components shall support weight of equipment, pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments or hangers, shall be of same size as pipe or tubing on which used, or nearest size available. Architect shall approve hanger material before installation. Do not support piping with plumbers' tape, wire rope, wood, or other makeshift devices. Where building structural members do not match piping support spacing, provide “trapeze” (bridging) support members attached to building structural members by methods approved by structural Engineer.

    a. Materials, design, and type numbers per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.

2. Hanger components shall be provided by one manufacturer. B-Line, Grinnell, Tolco, Afcon, Loos & Co., Uni-Strut, or equal.
3. Hanger and Supports:

    a. Vertical Piping: Tolco Fig. 6, or equal, clamps attached to pipe above each floor to rest on floor. Provide intermediate support for vertical piping greater than 25 feet in length.
    b. Individually Suspended Piping: Tolco Fig. 200 or Fig. 1 Clevis, complete with threaded rod, or equal.

Pipe Size	Rod Size
4" and Smaller	3/8"
5" to 6"	5/8"

    c. Trapeze Suspension: Sch-10 or Sch-40 steel pipe trapeze member in accordance with NFPA 13- published load ratings.
    d. Pipe Clamps and Straps: B-Line B2000 or B2400, Tolco, Fig. 200 or Fig. 1, or equal. Where used for seismic support systems, provide B-line B2400, Tolco fig. 69 series retainer pipe straps, or equal.
    e. Concrete Inserts: B-line B221 continuous insert or B2500 spot insert, or equal. Do not use actuated fasteners for support of overhead piping unless approved by Architect.
    f. Steel Connectors: Tolco Fig. 65 beam clamps with Fig. 69 retainer straps, or equal.
    g. Deck Connectors: Afcon Fig. 610 steel ceiling plate, or equal, where approved by structural Engineer.

4. Support to Structure:

    a. Wood Structure: Provide and install wood blocking as required to suit structure. Provide lag screws or through bolts with length to suit

requirements, and with size (diameter) to match the size of hanger rods required.

1) Do not install Lag screws in tension without written review and acceptance by Structural Engineer.

Side Beam Angle Clip	B-Line B3062--MSS Type 34
Side Beam Angle Clip	B-Line B3060
Ceiling Flange	B-Line B3199

2) Blocking for support of piping shall be not less than 2 inch thick for piping up to 2 inch size. Provide 3 inch blocking for piping up through 5 inch size, and 4 inch blocking for larger piping. Provide support for blocking in accordance with Structural Engineers requirements.
3) Where lag screws are used, length of screw shall be 1/2 inch less than the wood blocking. Pre-drill starter holes for each lag screw.

b. Steel Structure: Provide and install additional steel bracing as required to suit structure. Provide through bolts with length to suit requirements of structural components. Burning or welding on structural member may only be done if approved by Architect.

5. Pipe hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced per NFPA 13, and per pipe manufacturer's listing, except as noted below.
6. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.
7. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.
8. Insulate copper piping from ferrous materials and hangers with two layers of 3 inch wide, 10 mil polyvinyl tape wrapped around pipe.
9. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.
10. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.

3.8 UNIONS AND FLANGE INSTALLATION

A. Install Watts, Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel pipe or material. Bushings or couplings shall not be used.

B. Install unions in piping NPS 2” and smaller and flanges in piping NPS 2-1/2” and larger whether shown or not at each connection to equipment and tanks, and at connections to automatic valves.

C. Locate unions for easy removal of equipment, tanks, or valves.

3.9 ACCESS DOOR INSTALLATION

A. Furnish and install access doors wherever required whether shown or not for easy maintenance of fire protection systems. Access doors shall provide for complete removal and replacement of equipment.

3.10 CONCRETE WORK

A. Concrete work required for Work of this Section shall be included under another section of the Specification, unless otherwise noted, including reinforced concrete bases for pumps, tanks, compressors unless the work is specifically indicated on Drawings to be furnished under this Section.

B. Thrust blocks, underground anchors, and pads for cleanouts, valve access boxes and washer boxes are included under this Section of the Specifications. Concrete shall be 3000 psi test minimum. Refer to Division 03 for concrete types.

3.11 PIPE IDENTIFICATION

A. Provide temporary identification of each pipe installed, at time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the Work.

B. Apply legend and flow arrow at valve locations; at points where piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction, and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with approval of Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.

C. Wherever two or more pipes run parallel, markings shall be supplied in the same relative location on each.

D. Apply markings after painting and cleaning of piping and insulation is completed.

3.12 EXPANSION ANCHORS IN HARDENED CONCRETE:

A. Refer to Structural Drawings.

3.13 TESTS AND ADJUSTMENTS

A. Test installations in accordance with the following requirements and all applicable codes:

1. Project Inspector should witness tests of piping systems.
2. Notify Architect at least seven days in advance of tests.
3. Notify local fire department of time and date of fire systems testing.

4. Piping shall be tested at completion of roughing-in, or at other times as directed by Architect.
5. Furnish necessary materials, test pumps, gases, instruments and labor required for testing.
6. Isolate from system equipment that may be damaged by test pressure.

B. Test Schedule: No loss in pressure or visible leaks shall show after four hours at pressures indicated:

System Tested	Test Pressure PSI	Test With
Fire Sprinkler Piping	200	Water
Compressed Air	200	Air & Non-corrosive Leak Test Fluid
Dry Standpipes	300	Water
Wet Standpipes	200	Water

1. Piping, including underground piping, connected to fire sprinkler system shall be tested and certified in accordance with NFPA requirements, except where requirements listed in this Section exceed requirements of NFPA.
2. Non-corrosive leak test fluid shall be suitable for use with piping material specified, and with type of gas conveyed by piping system.

C. Should material or work fail in any of these tests, it shall be immediately removed and replaced with new material, and portion of work replaced shall again be tested by Contractor at his own expense.

D. Lubricate each item of equipment, including motors, before operation.

3.14 TRACER WIRE INSTALLATION

A. Provide tracer wire for non-metallic water pipe in ground outside of buildings. Use AWG #14 tracer wire with blue colored low density high molecular weight polyethylene insulation, and lay continuously on pipe so that it is not broken or stressed by backfilling operations. Secure wire to the piping with tape at 18 inch intervals. Solder all joints.

B. Terminals: Precast concrete box and cast iron locking traffic cover, Brooks 3TL, or equal; cover marked with name of service; 6 inches of loose gravel below box. Plastic terminal board with brass bolts; identify line direction with plastic tags. Test for continuity between terminals, after backfilling, in presence of Inspector.

C. Alternate: Use electronically detectable plastic tape with metallic core, Terra Tape D, manufactured by Reef Industries, Inc., Seton, Inc., Marking Services, Inc., or equal; tape 2 inches wide, continuously imprinted "CAUTION WATER LINE BELOW". Install, with printed side up, directly over pipe, 18 inches below finish grade. Backfill material

shall be as previously specified for the particular condition where pipe is installed, but avoid use of crushed rock or of earth with particles larger than l/2 inch within the top 12 inches of backfill. Take precautions to insure that tape is not damaged or misplaced during backfill operations. Terminal boxes not required.

3.15 CHECK, TEST AND START REQUIREMENTS

A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of fire protection equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.

1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.
2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
4. When work has been completed, provide copies of reports for review, prior to final observation of work.

B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.

C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each operating and maintenance manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

3.16 COMMISSIONING AND PRELIMINARY OPERATIONAL TESTS

A. Prior to observation to determine final acceptance, put fire protection systems into service and check that work required has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of tests.

1. Equipment has been started, checked, lubricated and adjusted in accordance with manufacturer's recommendations.
2. Correct rotation of motors and ratings of overload heaters are verified.
3. All manufacturers' certificates of start-up specified have been delivered to Owner.
4. All equipment has been cleaned, and damaged painted finishes touched up.
5. Missing or damaged parts have been replaced.
6. Flushing of piping systems has been completed and water treatment equipment, where specified, is completed.
7. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.

8. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
9. Maintenance manuals have been delivered and Owner training has been completed.

B. Review of Contractor's Tests:

1. Tests made by Contractor or manufacturers' representatives are subject to observation and review by Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon completion of tests, provide letter to confirm that testing has been successful.

C. Test Logs:

1. Maintain test logs listing the tests on mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of tests.

END OF SECTION 21 00 50

SECTION 21 10 00

FIRE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sprinkler heads.
2. Pipe and Fittings.
3. Valves.
4. Fire hydrant.
5. Reduced pressure backflow preventer.
6. Double check valve backflow preventer.
7. Water flow alarm switch.
8. Fire Department connection.
9. Post indicator valve.
10. Antifreeze system.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 21 00 50 Basic Fire Sprinkler Materials and Methods.

1.3 REFERENCES

A. It is the intent of these Specifications to provide for complete and operating fire protection automatic sprinkler system in full compliance with the following standards:

1. National Fire Protection Association (NFPA) Standard No. 13, 2022, as amended by the CBC.
2. CBC Chapter 9.
3. NFPA No. 20, 2019.
4. NFPA No. 24, 2019 (as amended).
5. NFPA No. 25, 2020 (California Edition).

B. The work shall also be in accordance with all local or state requirements that apply.

1.4 DESCRIPTION OF WORK

A. Work of this section includes, but is not limited to, the following:

B. Furnish all coordination, labor, design drawings, calculations, materials, tools, and equipment to install the wet pipe automatic fire sprinkler system as described in this Specification Section. System shall be hydraulically calculated and designed for the building occupancy classification as determined by NFPA 13.

1. The Work includes, but is not limited to the following:

    a. Complete automatic fire risers, including valves, fire department connections, flow switches, pressure switch and service mains as indicated.
    b. Complete interior wet type automatic fire protection spray type sprinkler distribution system, including overhead service and branch mains, lateral supply piping, supports, hangers, seismic bracing, and heads
    c. Required tests and inspections.
    d. Provide electrical work required to complete the system. Contractor shall be responsible for providing complete and operable systems, including electrical wiring. Install wiring in conduit, in accordance with Division 26.
    e. Protected areas shall include areas above and below the finished ceilings, exterior exposure, canopies, stairways, rooms, areaways, entry, etc, and other areas requiring sprinklers. Thoroughly examine architectural and other drawings as required to satisfy this requirement.
    f. Tags, identification labels and instruction manuals for proper operation and maintenance.

C. Provide fire sprinklers to protect combustible building overhangs greater than 4 feet wide, as required by local authority.

D. Determine the static and residual pressure for the site as required for accurate determination of system requirements. Base system calculations on the lowest expected static and residual pressure for the area.

1. Test data for static and residual pressure shall be obtained from water district or local fire department; test shall be made within the last six months prior to start of work.
2. Provide calculations based on 10 percent minimum safety factor. For hydraulically calculated fire sprinkler systems the maximum velocity in the building and the fire main piping shall not exceed 15 feet per second.

1.5 DRAWINGS

A. Contractor shall thoroughly examine architectural, structural, and other Drawings provided as part of this Contract.

B. Number of sprinkler heads indicated on Contract Drawings shall not be reduced. Provide additional heads required for coordination and to obtain approvals. Coordinate suitable head locations and spacing with Architect.

1.6 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of fire protection products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer Qualifications: A firm with at least five years of successful installation experience on projects with fire sprinkler piping systems similar to that required for this Project.

1. A State of California Fire Protection Contractor's license (C-16) is required.

C. Fire Sprinkler Fitter Certification:

1. Automatic fire extinguishing systems sprinkler pipefitters shall be certified by Office of the State Fire Marshall (OSFM).

D. Design Criteria: Provide complete fire protection systems as indicated and as required by authority having jurisdiction.

1. When there is conflict between requirements of authority having jurisdiction or requirements of other agencies and these Drawings and Specifications, requirements of authority having jurisdiction and recommendations of standards agencies shall govern.
2. Design and install entire system in accord with applicable codes, standards, and regulations.
3. The automatic sprinkler system shall conform to requirements of the National Fire Protection Association, Standard No. 13, as amended by the CBC. Contractor shall hydraulically calculate sprinkler system in accordance with NFPA 13.
4. Drawings are diagrammatic only to indicate rooms/areas of sprinkler protection and piping clearances when appropriate. Rerouting of pipe and addition, deletion or relocation of heads may be necessary. Submit proposed layout for approval prior to start of installation.
5. FM Compliance: Comply with Factory Mutual "Approval Guide."
6. Supply equipment and accessories in accordance with requirements of all applicable national, state and local codes.
7. Items of a given type shall be the products of the same manufacturer.
8. Scheduled equipment performance is minimum capacity required.
9. Scheduled electrical capacity shall be considered as maximum available.

1.7 COORDINATION

A. Coordinate Work in this Section with trades covered in other Sections of Specifications to provide a complete and operable installation of highest quality workmanship.

B. Coordinate location of fire protection piping, mains and branches, to avoid interference with work by other trades. Plumbing drainage piping and ductwork shall have right-of-way over fire protection piping. Wherever conflicts exist, fire protection piping shall be offset or rerouted at no additional cost to Owner. Provide locations of piping for use in Coordinated Layout called for in Specification Section 23 80 00.

C. Piping shall be concealed, except where so indicated or where absolutely necessary to be exposed. Exposed piping shall be placed as approved by Architect prior to installation. Heads shall be fully coordinated with architectural reflected ceiling plan and placed in center of ceiling tiles.

D. On-site measurement of pipe will be required. Offsets, pipe, fittings, drains, etc., required to meet job conditions shall be furnished and installed at no extra cost to Owner.

E. Additional heads required by NFPA 13 regulations shall be provided at no extra cost, if required as a result of Contractors' coordination. Location of heads and mains shall not be changed unless approved by Architect.

F. Coordinate layout and installation of sprinklers with other construction penetrating ceilings, including light fixtures, HVAC equipment, and partition assemblies.

G. The Architect shall decide any differences or disputes concerning coordination, interference or extent of work, and his decision shall be final.

1.8 SUBMITTALS

A. Samples: Provide one sample of each sprinkler head type.

B. Shop Drawings: Submit in accordance with Division 01, and as follows:

1. Prepare Drawings, calculations, and product data of fire protection systems indicating pipe sized, pipe locations, fittings, shutoffs, equipment, etc. Note, in bold type, any piping which will project beyond finished surfaces of normally occupied rooms, exterior of the building or other locations which will expose the system to view.
2. Layout drawings and flow calculations approved by agencies having jurisdiction.
3. Drawings and calculations shall be stamped and signed by a State of California licensed professional engineer prior to submission to the Architect. Engineer shall be qualified for this work.

C. Manufacturer's data for each item of material or equipment used.

D. Welding operator qualification certificates.

E. Office of the State Fire Marshall (OSFM) certification cards for automatic fire extinguishing systems sprinkler pipefitters.

F. Test Reports: As indicated in paragraph "Tests".

1. Sprinkler pressure test.
2. Alarm system test.
3. Underground piping test.

G. Operation and Maintenance Manual:

1. Operation and Maintenance Manual in accordance with Section 21 00 50. Include an original copy of NFPA 25, California edition, in Operation and Maintenance Manual for fire sprinkler system.
2. Guarantees in accordance with Division 01.

H. Deferred Approval Documents: Do not proceed with fabrication or installation of fire sprinkler system until deferred approval documents have been approved by regulatory agencies.

1. General: Provide detailed drawings, specifications, and calculations prepared by a State of California licensed professional engineer.

a. Documents produced by the Contractor shall be stamped and signed by the licensed mechanical engineer responsible for their preparation.

2. Architect Review: Make additions, changes and corrections as directed by Architect and resubmit.
3. Agency Review: Architect will submit documents to Agency or Authority Having Jurisdiction. Make additions, changes and corrections required by Agency / Authority at no cost to Owner and resubmit to Architect.
4. Agency Approval: Architect will submit documents to Agency / Authority for final approval.

1.9 APPLICABLE PUBLICATIONS

A. The following publications form a part of this specification:

1. ANSI - American National Standards Institute.
2. ASME - American Society of Mechanical Engineers.
3. UL - Underwriters' Laboratories, Inc. Fire Resistance Directory.
4. CBC - California Building Code.
5. NFPA National Fire Protection Standards as amended by the CBC.
6. CFC - California Fire Code.
7. CPC - California Plumbing Code.

1.10 SUPERVISION

A. Keep a competent superintendent on the job that shall coordinate the activities of the crafts and maintain the progress of the work to the satisfaction of the Architect.

1.11 SITE CONDITIONS

A. Verify all dimensions at the building site and check existing conditions before beginning work. Make changes that are necessary to coordinate the work with other trades, after review by the Architect.

1.12 REGULATIONS

A. All work shall be installed in strict conformity with California Building Code (CBC), California Plumbing Code (CPC), and California Electric Codes (CEC), Industrial Safety Orders, California Mechanical Code (CMC), California Fire Code (CFC), and other laws and regulations of authorities having jurisdiction.

1.13 FEES AND PERMITS

A. Take out permits and pay fees and charges required in connection with the Work.

1.14 TEMPORARY CONNECTIONS

A. Temporary connections required to maintain services during the course of the Contract shall be made without additional cost to Owner. The normal function of the building must not be interrupted; notify Owner minimum seven days in advance before interrupting any service.

PART 2 - PRODUCTS

2.1 GENERAL

A. The equipment to be furnished under this Specification shall be standard product of manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, component parts of system need not be products of the same manufacturer.

2.2 MATERIALS AND EQUIPMENT

A. Unless otherwise shown on Drawings, specified, or directed by Architect, materials and equipment used in installation of sprinkler systems shall be listed as approved by FM or UL for fire protection systems, and shall be the latest design of the manufacturer.

2.3 SPRINKLER HEADS

A. Provide spray pattern type sprinkler heads, of ordinary degree temperature rating, except that sprinkler heads for installation in vicinity of heating equipment, and in other areas noted on Drawings, shall have temperature ratings required for such locations by NFPA 13.

B. Sprinkler heads shall be upright, pendent, or sidewall, as required.

1. Heads in ceilings of occupied spaces with recessed lights shall be chrome plated, semi-recessed pendent type, with white escutcheon.
2. Sprinkler heads in rooms with surface mounted lights shall be chrome plated pendant style, with two-piece white escutcheon.
3. Provide head guards in equipment rooms and storage rooms and all other locations where subject to damage.
4. Upright heads in areas with no ceilings shall be rough bronze finish.
5. Provide quick response type heads in light and ordinary hazard occupancies.
6. Side wall heads may be used (except in extended coverage type) to cover special areas where overhead piping and heads are impractical or a considered visual problem by the Architect or Owner. Side wall heads shall be chrome finish.
7. Outdoor heads, if required shall be dry or freeze resistant.
8. Adjustable drop nipples are not acceptable.

C. Recessed sprinkler heads shall have chrome finish and adjustable chrome finish escutcheons; exposed pendent heads in finished ceilings shall have chrome finish and white ceiling escutcheons. Concealed (flush) heads shall be all brass, with white cover plate.

1. Provide oversized escutcheons where required to meet the requirements of ASCE 7.

D. Spare Heads: Furnish spare heads equal to one percent of total number of heads installed under Contract, but not less than twelve. Spare head types furnished shall be representative of types and temperature ratings of heads installed, and in proportion to number of each type and temperature rating of heads installed. Furnish not less than two sprinkler head wrenches, with at least one wrench for each type of sprinkler head installed. Place spare heads and wrenches in wall mounted box manufactured for this purpose.

2.4 PIPE AND FITTINGS

A. For Installation Aboveground: 150 PSI, Schedule 40 black steel pipe, ASTM A-53 with ductile or cast iron screwed fittings.

1. Schedule 10 black steel pipe, ASTM A 135 or ASTM A 795, with grooved fittings and associated couplings may be used for pipe sizes 2 inches through 5 inches. Provide NFPA 13-specified wall thickness for pipe sizes 6 inches through 10 inches. Threading of piping will not be accepted.

B. For Installation Underground to 12 inches Above Ground:

1. Pipe and fittings shall be approved for fire protection use.

2. Underground Piping Outside Building: PVC Pipe: AWWA C900 or UL 1285, Class 200, with bell end with gasket, and with spigot end. PVC Fittings: AWWA C900 or UL 1285, Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1) Diamond Plastics Corporation.
2) J.M. Eagle, Inc.

3. Underground Piping Below Building Footing and Slab: One-piece, 304 stainless steel 90-degree fitting, with AWWA C900 bell-and-spigot gasketed inlet connection with lugs on inlet end, and AWWA C606 groove on outlet end, for connection to in-building riser using AWWA C606 grooved couplers and gaskets.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1) Ames Fire and Waterworks, a Watts Water Technologies Company.
2) Wilkins, a Zurn Company.

C. Standpipes: Schedule 40 galvanized steel with 300 psi galvanized fittings.

D. Mechanical tees, saddle fittings, bushings and mechanical sprinkler head fittings shall not be used.

2.5 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Material: Linear low-density PE film of 0.008-inch minimum thickness.

C. Form: Tube.

D. Color: Natural.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. Northtown Pipe Protection Products; Polywrap.

2.6 VALVES

A. Angle, Check, and Globe Valves: Fed. Spec WW-V-51; Class A, type as suitable for application.

1. Select check valves for installation in vertical lines recommended by manufacturer as suitable for vertical installation. Install in vertical lines only where flow is upward.

B. Gate Valves:

1. Sizes 1-1/2 inches or less: Fed. Spec WW-V-54, Class A.
2. Sizes above 1-1/2 inches: Fed. Spec WW-V-58, Class A, designation OS or OF, as required. Provide OS&Y type, 175 pound rated working pressure.
3. Furnish and deliver to Owner one wrench of each size required for operating underground valves.

C. Drain Valves: angle, or globe. Fed. Spec WW-V-51; Class A, type as suitable for application.

1. UL listed and FM approved combination test and drain fittings may be used.

D. Zone Control Valves: UL listed, outside screw and yoke or butterfly. Valves shall be sealed open with approved seal. Provide weatherproof actuator housing, with two single pole, double throw switches.

1. Supervisory Switch: Fit the control valves on the fire sprinkler risers with supervisory switch, with single pole double throw switch actuator installed to change switch position when valve is being closed.

E. Sprinkler Inspector's Test Fittings:

1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
2. Pressure Rating: 175-psig minimum.
3. Body Material: Cast- or ductile-iron housing with sight glass.
4. Integral factory or field-installed pressure relief valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

2.7 REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER

A. Provide reduced-pressure principle backflow preventer assembly, including shutoff valves on inlet and outlet, and strainer on inlet, equal to Febco 860 or 880, as required. Backflow preventer shall include test cocks, and pressure differential relief valve located between two positive seating check valves. Construct in accordance with ASSE Standard 1013.

B. Provide minimum 13 gage one or two piece expanded metal backflow preventer enclosure, sized to suit size of backflow preventer. Furnish with mounting hardware and provision for locking enclosure in closed position. Install on concrete pad, in accordance with manufacturer's installation instructions.

1. Manufacturer: Subject to compliance with requirements and local fire and water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. LeMeur Welding and Manufacturing: BF series.
b. Backflow Protection Co.: Ultimate Tuff Cage.

C. Provide padlock and chain to lock valves in open position, and give key to Project Inspector.

1. Padlocks shall be as specified under Section 08 70 00.
2. Chain shall be of carbon steel, 3/8 inch wire diameter, fully welded links and weight of 140 pounds per 100 linear feet. Chain shall be hot galvanized.

D. Provide capped connections at each test cock. Install in accordance with requirements of authority having jurisdiction.

E. Provide water flow alarm switch at each main valve. Arrange to provide alarm if valves are closed.

F. For units installed within buildings, provide drain, connected to unit, to collect spillage from atmospheric vent. Run drain to nearest floor sink or drain.

G. Provide two concrete filled, 6-inch diameter pipe bollards to protect exposed piping from motor vehicle damage.

H. Manufacturer: Subject to compliance with requirements and local fire and water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Ames Fire and Waterworks: A division of Watts Water Technologies, Inc.
2. Febco: A division of Watts Water Technologies, Inc.
3. Watts Water Technologies, Inc.
4. Wilkins: A Zurn Company.
5. Conbraco Industries, Inc.

2.8 DOUBLE CHECK DETECTOR VALVE BACKFLOW PREVENTERS

A. Provide double detector check valve assembly consisting of two spring loaded brass check valves, two cast iron bronze fitted gate valves and four test cocks, equal to Febco Model 856 or 876 as required. Construct in accordance with ASSE Standard 1048.

B. Provide minimum 13 gage one or two piece expanded metal backflow preventer enclosure, sized to suit size of backflow preventer. Furnish with mounting hardware and provision for locking enclosure in closed position. Install on concrete pad, in accordance with manufacturer's installation instructions.

1. Manufacturer: Subject to compliance with requirements and local fire and water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. LeMeur Welding and Manufacturing: BF series.
b. Backflow Protection Co.: Ultimate Tuff Cage.

C. Provide padlock and chain to lock valves in open position, and give key to Project Inspector.

1. Padlocks shall be as specified under Section 08 70 00.
2. Chain shall be of carbon steel, 3/8 inch wire diameter, fully welded links and weight of 140 pounds per 100 linear feet. Chain shall be hot galvanized.

D. Provide water flow alarm switch at each main valve. Arrange to provide alarm if valves are closed.

E. For units installed within buildings, provide drain, connected to unit, to collect spillage from atmospheric vent. Run drain to nearest floor sink or drain.

F. Provide capped connections at each test cock. Install in accordance with requirements of authority having jurisdiction.

G. Provide two concrete filled, 6 inch diameter pipe bollards to protect exposed piping from motor vehicle damage.

H. Manufacturer: Subject to compliance with requirements and local fire and water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

Ames Fire and Waterworks: a division of Watts Water Technologies, Inc.
Febco: a division of Watts Water Technologies, Inc.
Watts Water Technologies, Inc.

Wilkins: a Zurn Company.
Conbraco Industries, Inc.

2.9 WATER FLOW ALARM SWITCH

A. UL listed water flow alarm switch suitable for variable pressure, complete with instantaneous recycling retard and two single pole double throw electrical contacts. Provide continuously monitored water flow alarm switch and trouble sensor, automatically transmitted to an approved control alarm station.

2.10 FIRE DEPARTMENT CONNECTION

A. Post mounted, complying with Local Fire Marshal standards cast brass two-way inlet body with drop clappers. Furnish with two brass double female snoots with rigid end N.P.T.X. pin lug house thread swivels, plugs and chain.

B. Provide check valve in piping between inlet connection and fire protection system. Provide ball drip at low point of piping, below grade on the inlet side of the check valve, and drain to gravel sump. Provide gravel sump with minimum 3 cubic feet of course gravel.

2.11 POST INDICATOR VALVE

A. Mueller, American Cast Iron Pipe Co., or equal, UL-listed; provide handle lock and water flow alarm switch.

2.12 ANTIFREEZE SYSTEMS

A. Provide dry pipe, preaction, or antifreeze systems for all portions of the fire protection system installed outside or in areas that cannot be maintained above 40 degrees F.

B. Dry pipe, preaction, or antifreeze systems shall be installed, labeled, and tested in accordance with NFPA 13.

C. Where solution based antifreeze systems are installed, Contractor shall provide antifreeze solution with a freezing point of minus 26 degrees F. or lower. Provide antifreeze test kit and adequate instructions for testing concentration and freeze point.

2.13 UNION AND FLANGES

A. Size and Type:

1. Steel 2 inches and smaller: 150 pound screwed black or galvanized malleable iron, match pipe, ground joint, brass to iron seat.
2. Steel 2-1/ inches and larger: 150 pound black flange union, flat faced, full gasket.

B. Gaskets: 1/16 inch thick rubber Garlock #122, Johns-Manville, or equal.

C. Flange Bolts: Open hearth bolt steel, square heads, with cold pressed hexagonal nuts, cadmium plated when installed below ground. Provide copper plated steel bolts and nuts or brass bolts and nuts for brass flanges.

2.14 GAUGES

A. Marsh "Quality Gage", U.S. Gage, Danton 800, or equal, U.L. listed, with bronze bushed movement and front recalibration. Dials shall be white with black numerals, 3-1/2 inch dial face. Normal reading shall be at midscale. Provide a three-way valve on each gauge connection.

2.15 SEISMIC SEPARATION ASSEMBLY

A. Provide seismic separation assembly as defined in NFPA 13 at locations where piping crosses building seismic joints and at locations where required to prevent pipe breakage due to building movement.

1. At Contractors option, provide Metraflex “Fireloop” UL listed assembly, or equal at each seismic joint location, in lieu of seismic separation assembly.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation of the sprinkler system shall not be started until complete plans and specifications (including water supply information and type of existing sprinkler system, if any) have been approved by the State Fire Marshal.

1. Piping shall be concealed unless shown or otherwise directed.
2. Where piping is left exposed within a room, it shall be run true to vertical, horizontal or intended planes. Where possible, uniform margins shall be maintained between parallel lines and/or adjacent wall, floor or ceiling surfaces.
3. Horizontal runs of pipes and/or electrical conduit suspended from ceilings shall provide for maximum headroom clearance. This clearance shall not be less than 6'-6" without written approval from Architect.
4. Minor changes in locations of equipment, piping, etc., from locations shown shall be made when directed by Architect at no additional cost to Owner, providing such change is ordered before such items of work, or work directly connected to same, are installed and providing no additional material is required.
5. Grade all piping as required by NFPA 13.
6. Close ends of pipe immediately after installation; leave closure in place until removal is necessary for completion of installation.
7. Piping systems shall be thoroughly flushed and proved clean before connection to equipment.
8. Pipe discharge of each drain valve to floor sink or drain.

3.2 HANGER AND SUPPORT INSTALLATION

A. General: Support piping so that it is firmly held in place by approved iron hangers and supports and by special hangers as required in accordance with NFPA 13. Hangers shall support loads specified in NFPA 13, and, in addition, shall support weight of pipe, fluid and pipe insulation, based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments, or hangers, shall be of same size as pipe

or tubing on which used, or nearest larger size available. Materials, design, and type numbers per Manufacturers' Standardization Society (MSS) Standard Practice SP-58, provide branch line restraints where hangers exceed 6 inches long, in accordance with NFPA 13. Install concrete anchors required. Hanger material shall be approved by Architect before installation. Do not support piping by plumbers' tape, wire, rope, wood or other makeshift devices.

B. Suspend rods from angle clips, in accordance with Section 21 00 50.

3.3 SEISMIC REQUIREMENTS

A. Comply with CBC, Volume 2, Chapter 16A and CBC Chapter 9 and NFPA 13.

B. Seismic bracing system shall be a complete pre-engineered bracing system. Pre-engineered bracing system shall include plan layout, brace selection, specification, and calculations. Complete system shall be submitted to Architect for review. See Delegated Design Submittal paragraph in article, Submittals, in Section 21 00 50.

C. Anchorage for various manufactured and fabricated items is detailed and scheduled on the drawings or specified.

1. For proposed changes to anchorage shown, or specified, submit proposed methods of anchorage with calculations prepared by a California Registered Structural Engineer. Design of anchorage shall comply with the above regulations using minimum coefficients, CP, listed CBC Chapter 16A.

D. It is not intended that prototype or non-standard equipment or equipment frames be provided. However, items of equipment shown or specified to be anchored shall maintain integrity at point of anchor after being subjected to accelerations equivalent to those established herein.

E. Anchors: Piping shall be provided with anchors for protection of piping against damage due to earthquakes, as required by CBC Chapter 16A, NFPA 13, and other sections of this Specification.

3.4 TESTS

A. At various stages and upon completion, the system must be tested in the presence of the enforcing agency.

B. Upon completion and prior to acceptance of the installation, subject entire new system to tests required in NFPA 13, and furnish Owner with certificates as appropriate.

3.5 IDENTIFICATION

A. Coordinate requirements with the authority having jurisdiction.

B. Provide brass valve tags at each system valve, indicating valve service.

C. Provide signage at each sprinkler valve, with sign indicating specific portion of system controlled by valve.

D. Provide signage at each outdoor alarm device, with sign indicating which authority to call if device is activated.

E. Prior to final acceptance, Contractor shall provide accurate color-coded Building Plan at riser location, clearly depicting fire protection system area of coverage, location of inspectors' test/drain connection and auxiliary drain connections. Provide this information at each system or building at riser location for building. Plan(s) shall be one-half size and plastic laminated.

F. Provide hydraulic data signage permanently attached to risers, indicating location, basis of design, water supply and pressure requirements of system.

3.6 ELECTRICAL WIRING

A. Coordination of wiring systems is part of this work. Contractor shall ensure that the following is completed.

1. Work provided in other Specification Sections:

a. Supervised wiring to fire alarm control panel.
b. Supervised wiring from main waterflow indicator to fire alarm panel.
c. Supervised wiring from sprinkler flow switches to fire alarm panel.
d. Supervised wiring from valve water flow alarm switches to fire alarm panel.

2. Work provided in this Specification Section:

a. Wiring diagrams for devices.
b. Other wiring not specified to provide an operating system.

3.7 SPRINKLER HEAD INSTALLATION

A. Heads shall be placed upright where on exposed piping, unless otherwise noted, and in pendant position on concealed piping, unless noted otherwise, with deflectors parallel to the ceiling or roof slope. Clearance between deflectors and ceilings, electric, or heating equipment, or other obstruction shall be in accordance with the requirements of NFPA 13. Provide sprinkler head guards where heads are subject to mechanical damage, for example, at mechanical rooms, and storage rooms and gymnasiums.

B. Mount box containing spare sprinkler heads and wrenches on wall in location selected by Owner.

C. Do not install pendent sprinkler heads until flushing of piping has been completed.

D. Provide return bend as illustrated in NFPA 13 (NFPA exceptions do not apply) for each sprinkler head installed in finished ceiling.

3.8 PIPING INSTALLATION

A. Pipe shall be assembled in accordance with the applicable requirements of NFPA 13 and NFPA 24.

B. Install pipe encasement on underground and under-slab metal piping.

C. Provide concrete thrust blocks for underground and underslab piping in accordance with NFPA 24 and CBC.

3.9 VALVE IDENTIFICATION

A. All valves shall be identified by permanent metal tags or other approved means.

3.10 DRAIN INSTALLATION

A. Auxiliary drains shall be installed on low points in each system.

1. Five or fewer trapped gallons will not require a drain valve but may be drained through a plugged fitting. Drain valves shall be in accordance with the requirements of NFPA 13.

B. Install one inspector's test drain on sprinkler system. Extend drain to outside in location approved by Architect. Water discharge shall be positioned such that landscaping will not be damaged.

C. Drain valves shall be piped to a safe place of discharge and discharge shall be visible either by open-end drainpipe or sight drain fitting.

D. Provide flushing connections at ends of cross-mains.

3.11 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers where indicated on Drawings. Provide available manufacturers drain connection, pipe drain outlet to nearest floor sink or drain.

1. Where drain pans are shown on Drawings, pipe drain pan outlet to nearest floor sink or drain.

3.12 SLEEVE INSTALLATION

A. Install AMI Products, Adjus-to-Crete, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations as directed shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.

B. At walls below grade Link-Seal casing seals, or equal, may be used in lieu of caulking. Pipes penetrating walls below grade shall be anchored at wall.

3.13 FLOOR, WALL, AND CEILING PLATE INSTALLATION

A. Fit pipes with or without insulation passing through walls, floors, or ceilings and hanger rods penetrating finished ceilings with chrome plated or stainless steel plates.

3.14 FIRESTOPPING

A. The annular space between pipe sleeves and pipe passing through all floors and walls shall be packed with incombustible mastic or other suitable material, in accordance with U.L. Fire Resistance Directory.

B. Penetrations in fire rated assemblies shall also be protected in accordance with CBC Chapter 7, Section 712, and UL Fire Resistance Directory.

3.15 UNION AND FLANGE INSTALLATION

A. Install unions whether shown or not at each connection to equipment and at one connection to each valve or cock.

B. Locate the unions for easy removal of the equipment or valve.

3.16 CLEANING

A. Upon completion of tests, clean equipment, piping, etc., installed under this Section of the Specifications.

3.17 PIPING SYSTEM FLUSHING

A. Entire system shall be flushed out and cleaned after completion of piping, and prior to installation of sprinkler heads. Flush shall be continued until water runs clear at drain connections.

3.18 ANTIFREEZE SYSTEM INSTALLATION

A. Install antifreeze systems at the following locations and as noted on Drawings.

1. Location: where required to meet NFPA 13, and/or Part 2 Paragraph (above) titled “ANTI FREEZE SYSTEMS”.

B. Install antifreeze loops in accessible areas, and provide adequate signs providing instructions on maintenance of the system. Obtain approval of antifreeze loop location from Architect prior to any construction work.

END OF SECTION 21 10 00

SECTION 22 00 50

BASIC PLUMBING MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electric motors.
2. Motor starters.
3. Strainers.
4. Valve boxes.
5. Gauges.
6. Thermometers.
7. Access Doors.
8. Expansion loops.
9. Flexible joints.
10. Insulation.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. This Section is a part of each Division 22 Section.

1.3 ADDITIONAL REQUIREMENTS

A. Furnish and install any incidental work not shown or specified which is necessary to provide a complete and workable system.

B. Make all temporary connections required to maintain services during the course of this Contract without additional cost to the Owner. Notify the Owner seven days in advance before disturbing any service.

C. Plumbing work done under this contract shall not adversely affect the operation of the existing plumbing systems.

1.4 REFERENCES AND STANDARDS

A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.

1. CSA – Canadian Standards Association International.
2. ANSI - American National Standards Institute.
3. ASTM - American Society for Testing and Materials.

4. CCR - California Code of Regulations.

    a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36.

5. NCPWB - National Certified Pipe Welding Bureau.
6. CEC - California Electrical Code.
7. NEMA - National Electrical Manufacturers' Association.
8. NFPA - National Fire Protection Association.
9. OSHA - Occupational Safety and Health Act.
10. UL - Underwriters' Laboratories, Inc.

B. Requirements of Regulatory Agencies:

1. The publications listed below form part of this specification; comply with provisions of these publications except as otherwise shown or specified.
    a. California Building Code, 2022.
    b. California Electrical Code, 2022.
    c. California Energy Code, 2022.
    d. California Fire Code, 2022.
    e. California Green Building Standards Code, 2022.
    f. California Mechanical Code, 2022.
    g. California Plumbing Code, 2022.
    h. California Code of Regulations, Title 24.
    i. California Health and Safety Code.
    j. CAL-OSHA.
    k. California State Fire Marshal, Title 19 CCR.
    l. National Fire Protection Association.
    m. Occupational Safety and Health Administration.
    n. Other applicable state laws.

2. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or specifications to repeat requirements of codes except where necessary for clarity.

1.5 DRAWINGS

A. Examine Contract Documents prior to bidding of work and report discrepancies in writing to Architect.

B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The Plumbing Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.

1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and

construction of the Project. Architectural Drawings take precedence over Plumbing Drawings.

2. Because of the small scale of Plumbing Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in the locations shown. Obtain the Architects approval prior to relocation of equipment and materials.
3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contactors' expense upon Architects' direction.
4. Minor changes in locations of equipment, piping, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.

C. Execute work mentioned in Specifications and not shown on Drawings, or vice versa, the same as if specifically mentioned or shown in both.

1.6 FEES AND PERMITS

A. Obtain and pay for all permits and service required in installation of this work; arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.

B. Arrange for utility connections and pay charges incurred, including excess service charges.

1. Bear the cost of construction related to utility services, from point of connection to utility services shown on Contract Documents. This includes piping, excavation, backfill, meters, boxes, check valves, backflow prevention devices, general service valves, concrete work, and the like, whether or not Work is performed by Contractor, local water/sanitation district, public utility, other governmental agencies or agencies' assigns.

C. Prior to the start of construction, contact local gas company representative and coordinate location of gas meter and piping. In addition, coordinate time required for installation, in order to avoid delay to the Project.

D. Coordination:

1. General:

a. Coordinate plumbing Work with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.

2. Electrical Coordination:

a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:

1) Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
2) If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.
3) Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.

3. Mechanical Coordination:

a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during progress of construction.
c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section “Access Doors and Frames.”
d. Coordinate with other trades equipment locations, pipe, duct and conduit runs, electrical outlets and fixtures, air inlets and outlets, and structural and architectural features. Provide information on location of piping and seismic bracing to other trades as required for a completely coordinated project.

1.7 SUBMITTALS - GENERAL

A. Refer to Division 01 Submittals Section(s) for additional requirements.

B. Submittal packages may be submitted via email as PDF electronic files, or as printed packages. PDFs shall be legible at actual size (100 percent). Provide seven copies of printed submittal packages.

C. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.

1. Partial or incomplete submittals will not be considered.
2. Quantities are Contractor's responsibility and will not be reviewed.

3. Provide materials of the same brand or manufacturer for each class of equipment or material.
4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.
6. Organize submittals in same sequence as in Specification Sections.
7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.

    a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
    b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
    c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
    d. Catalog cuts and published material may be included with supplemental scaled drawings.

D. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.

E. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect Shop Drawings or submittals on all items of equipment and materials provided. Provide submittal in at least seven copies and in complete package.

    1. Shop Drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.

F. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.

1.8 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing systems materials and products.

B. Shop Drawings.

C. Sustainable Design Submittals:

1. Product Data: For adhesives and sealants, documentation of compliance including printed statement of VOC content and chemical components.
2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

D. Pipe, pipe or plumbing fittings, fixtures, solder and flux installed in a system providing water for human consumption shall comply with lead free requirements of the California Health and Safety Code Section 116875. Provide submittal information for products third-party certified by an approved laboratory as complying with California Health and Safety Code Section 116875.

E. Delegated-Design Submittals: For seismic supports, anchorages, restraints, and vibration isolators indicated to comply with performance requirements and design criteria.

1. Calculations performed for use in selection of seismic supports, anchorages, and restraints shall utilize criteria indicated in Structural Contract Documents.
2. Include design calculations and details for selecting vibration isolators and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the California registered structural engineer responsible for their preparation.
3. Supports, anchorages and restraints for piping, ductwork, and equipment shall be an OSHPD pre-approved system such as TOLCO, ISAT, Mason, or equal. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.

a. Bracing of Piping and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation.
b. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, ductwork, and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with California Building Code

4. Additional Requirements: In addition to the above, conform to all state and local requirements.

1.9 INFORMATIONAL SUBMITTALS

A. Provide layouts for plumbing systems, for inclusion in coordinated layout specified in Section 23 80 00. Comply with requirements for layouts specified in Section 23 80 00.

1.10 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Refer to Division 01 for complete instructions.
2. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Begin compiling data upon approval of submittals.

a. Sets shall incorporate the following:

1) Product Data.
2) Shop Drawings.
3) Record Drawings.
4) Service telephone number, address and contact person for each category of equipment or system.
5) Complete operating and maintenance instructions for each item of plumbing equipment and systems.
6) Copies of guarantees/warrantees for each item of equipment and systems.
7) Test data and system balancing reports.
8) Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
9) Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
10) Control diagrams and literature.
11) A complete list or schedule of all scheduled valves giving the number of the valve, location and the rooms or area controlled by the valve. Identify each valve with a permanently attached metal tag stamped with number to match schedule. Post list in frame under plastic on wall in mechanical room or where directed by Architect.
12) Check test and start reports for each piece of plumbing equipment provided as part of the Work.
13) Commissioning and Preliminary Operation Tests required as part of the Work.

b. Post service telephone numbers and/or addresses in an appropriate place as designated by the Architect.

B. Record Drawings:

1. Refer to Division 01, Record Documents, for requirements governing Work specified herein.
2. Upon completion of the work, deliver to Architect the following:

a. Originals of drawings showing the Work exactly as installed.
b. One complete set of reproducible drawings showing the Work exactly as installed.
c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
d. Provide Contractor's signature, verifying accuracy of record drawings.
e. Obtain the signature of the Project Inspector for all record drawings.

1.11 SUBSTITUTIONS

A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In the case of conflict between requirements given herein and those of Division 01, Division 01 requirements shall apply.

B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.

C. Substitutions will be interpreted to be all manufacturers other than those specifically listed in the Contract Documents by brand name, model or catalog number.

D. Only one request for substitution will be considered for each item of equipment or material.

E. Substitution requests shall include the following:

1. Reason for substitution request.
2. Complete submittal information as described herein; see "Submittals."
3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
5. Explanation of impact on connected utilities.
6. Explanation of impact on structural supports.

F. Installation of reviewed substitution is the Contractors' responsibility. Any mechanical, electrical, structural, or other changes required for installation of reviewed substituted equipment or material must be made by the Contractor without additional cost to the Owner. Review by the Architect of the substituted equipment or material, including dimensioned Drawings will not waive these requirements.

G. Contractor may be required to compensate the Architect for costs related to substituted equipment or material.

1.12 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of plumbing systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with plumbing systems work similar to that required for this Project.

C. California Health and Safety Code Compliance: For products covered under the scope of HSC 116875 for potable water service. Products for potable water service shall be third-party certified by an approved laboratory as complying with California Health and Safety Code Section 116875.

D. Comply with applicable portions of California Plumbing Code pertaining to selection and installation of plumbing materials and products.

E. All materials and products shall be new and shall match existing.

1.13 DELIVERY, STORAGE, AND HANDLING

A. Protect equipment and piping delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

1.14 FIELD CONDITIONS

A. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.

B. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

1.15 WARRANTY

A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor’s Standard Guarantee.

B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.

C. On failure to comply with the warranty requirements within a reasonable length of time after notification is given, the Architect/Owner shall have the repairs made at the Contractor's expense.

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.

B. All sizes, capacities, and efficiency ratings shown are minimum, except that gas capacity is maximum available.

C. Refer to Sections 22 10 00 and 23 80 00 for specific system piping materials.

2.2 MATERIALS AND PRODUCTS

A. No material installed as part of this Work shall contain asbestos.

B. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

2.3 ELECTRIC MOTORS

A. General Motor Requirements: Comply with NEMA MG 1 unless otherwise indicated. Comply with IEEE 841 for severe-duty motors.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. U.S. Motors.
b. Century Electric.
c. General Electric.
d. Lincoln.
e. Gould.

B. Motor Characteristics: Designed for continuous duty at ambient temperature of 40 deg. C and at altitude of 3300 feet above sea level. Capacity and torque shall be sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

1. Motors exceeding the nameplate amperage shall be promptly replaced at no cost to the Owner. Horsepower shown is minimum and shall be increased as necessary to comply with above requirements. Furnish motors with splash-proof or weatherproof housings, where required or recommended by the manufacturer. Match the nameplate voltage rating with the electrical service supplied. Check Electrical Drawings. Provide a transformer for each motor not wound specifically for system voltage.

C. Polyphase Motors: NEMA MG 1, Design B, medium induction motor, premium efficiency as defined in NEMA MG 1. Select motors with service factor of 1.15. Provide motor with random-wound, squirrel cage rotor, and permanently lubricated or regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading. Temperature rise shall match insulation rating. Provide Class F insulation.

1. Multispeed motors shall have separate windings for each speed.

D. Polyphase Motors with Additional Requirements:

1. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
2. Motors Used with Variable Frequency Controllers:

    a. Separately Connected Motors: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
    b. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
    c. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
    d. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
    e. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
    f. Each motor shall be provided with a shaft grounding device for stray current protection.

3. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

E. Single-Phase Motors:

1. Select motors with service factor of 1.15.
2. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

    a. Permanent-split capacitor.
    b. Split phase.
    c. Capacitor start, inductor run.
    d. Capacitor start, capacitor run.

3. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

4. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
5. Motors 1/20 HP and Smaller: Shaded-pole type.

F. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.4 MOTOR STARTERS

A. Square D, Allen Bradley, or equal, in NEMA Type 1 enclosure, unless otherwise specified or required. Minimum starter size shall be Size 1. Provide NEMA 3R enclosure where exposed to outdoors.

B. Provide magnetic motor starters for equipment provided under the Mechanical Work. Starters shall be non-combination type. Provide part winding or reduced voltage start motors where shown or as hereinafter specified. Minimum size starter shall be Size 1.

1. All starters shall have the following:

a. Cover mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.
b. Ambient compensated thermal overload.
c. Fused control transformer (for 120 or 24 volt service).
d. Pilot lights, integral with the starters. Starters located outdoors shall be in NEMA IIIR enclosures.

2. Where three phase motors are provided for two-speed operation, provide two speed motor starters.
3. Starters for single-phase motors shall have thermal overloads. NEMA I enclosure for starters located indoors, NEMA IIIR enclosure for starters located outdoors.
4. Provide OSHA label indicating the device starts automatically.

2.5 STRAINERS FOR POTABLE WATER SYSTEMS

A. Strainers: Full line size, conforming to lead-free requirements of California Health and safety Code Section 116875. "Y" pattern, 125 psi SWP minimum, with 304 stainless steel screens. Install all strainers with a blow-off hose valve with hose adapter. Strainer shall have gasketed cover with straight thread.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. 3 inches and smaller: bronze or brass body, threaded ends, with 20 mesh screen. Watts LF777SI, Wilkins SXL.
b. 4 inches and larger: Cast iron body, flanged ends, 1/16 inch or 1/8 inch screen as normally supplied for each size. Watts 77F-DI-125, Mueller 758.

2.6 STRAINERS FOR NON-POTABLE WATER SYSTEMS

A. Charles M. Bailey #100A, Armstrong, Muessco, or equal, Fig. 11 "Y" pattern, 125 psi WP minimum, with monel screens with 20 square mesh for 2 inches and smaller and 3/64 inch perforations for 2-1/2 inches and larger. Install all strainers with a blow-off hose valve with hose adapter. Strainer shall have gasketed cover with straight thread.

2.7 VALVE BOXES

A. General:

1. Where several valves or other equipment are grouped together, provide larger boxes of rectangular “vault” type adequately sized for condition and similar in construction to those specified above.
2. Provide valve box extensions as required to set bottom of valve box tight up to top of piping in which valve is installed.
3. Provide a tee handle wrench for each size, Alhambra Foundry Co. #A-3008, or equal.

B. Valve Boxes in Traffic Areas: Provide Christy No. G5 traffic valve box, Brooks, or equal, 10-3/8 inches inside diameter with extensions to suit conditions, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves.

C. Valve Boxes in Non-Traffic Areas: Provide Christy No. F22, Brooks, or equal, 8 inches inside diameter by 30 inches long, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves. Cut bottom of plastic body for operation of valves.

D. Valve Box (Rectangular Vault Type): Precast concrete or cast iron with cast iron or steel locking type covers lettered to suit service – Brooks No. 3-TL, Christy No. B3, Fraser No. 3, Alhambra A-3004 or A-3005, Alhambra E-2202, or E-2702, or equal, with extension to suit conditions.

2.8 GAUGES

A. Marsh "Series J", U.S. Gage, Danton 800, or equal, with bronze bushed movement and front recalibration. Dials shall be white with black numerals, 3-1/2 inch dial face. Normal reading shall be at mid-scale. Provide a needle valve on each gauge connection. Supply a gauge piped with branch isolation valves across the inlet and outlet of each pump and where shown on the Drawings.

B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core {and gasketed cap}, on inlet and outlet of each coil, boiler, condenser, chiller and heat exchanger and where shown on Drawings.

2.9 THERMOMETERS

A. Marsh, Taylor, Palmer, or equal, 5 inch diameter bimetal dial, adjustable from face, with adjustable positioner, located to be easily read from normal personnel approach. Normal reading shall be at mid-scale.

1. Provide extension for insulation.
2. Provide thermometers with steel bulb chambers and brass separable sockets.

B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core, on inlet and outlet of each coil, boiler, and heat exchanger and provide two digital electronic test thermometers for each range of fluid temperature and where shown on Drawings.

2.10 ACCESS DOORS

A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.

1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.

B. Access doors shall match those supplied in Division 08 in all respects, except as noted herein.

C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.

D. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.

E. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.

F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:

1. Milcor

a. Style K (plaster).
b. Style DW (gypsum board).
c. Style M (Masonry).
d. Style "Fire Rated” where required.

2.11 THERMAL AND SEISMIC EXPANSION LOOPS

A. Manufactured assembly consisting of inlet and outlet elbow fittings, two sections of flexible metal hose and braid, and 180-degree return bend. Return bend section shall have support lug and plugged FPT drain. Flexible hose shall consist of corrugated metal inner hose and braided metal outer sheath. Assemblies shall be constructed from materials compatible with the fluid or gas being conveyed and shall be suitable for the system operating pressure and temperature. Provide assembly selected for 4 inches of movement.

B. Provide CSA certified expansion loops for use in propane gas piping systems.

C. Where used in potable water systems, provide expansion loops of certified lead-free construction.

D. Basis-of-Design Product: Subject to compliance with requirements, provide Metraflex Inc., Metraloop series, or comparable product by one of the following, or equal:

1. Flexicraft Industries.

2.12 FLEXIBLE JOINTS

A. Where indicated on Drawings, provide Metraflex Metrasphere, Style R, Mason Industries, or equal, Spherical Expansion Joints. Provide control units at each expansion joint, arranged to limit both expansion and compression.

B. Flexible joints at entry points to building shall be Barco Ductile iron, Advanced Thermal Systems, or equal, threaded style with stainless ball and mineral filled seal.

2.13 PIPE GUIDES

A. Where flexible connections are indicated on Drawings, provide Metraflex style IV, B-Line, or equal, pipe guides in locations recommended by manufacturer. Maximum spacing from flexible connection to first pipe guide is 4 pipe diameters, and maximum spacing from second pipe guide is 14 pipe diameters.

2.14 EQUIPMENT IDENTIFICATION

A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

2.15 PIPE IDENTIFICATION

A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.

B. The legends and flow arrows shall conform to ASME A13.1.

2.16 INSULATION WORK

A. General:

1. For insulating domestic hot water pumps, refer to Section 225000, Plumbing Equipment,
2. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).
3. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
4. The term "piping" used herein includes pipe, valves, strainers and fittings.
5. Apply insulating cement to fittings, valves and strainers and trowel smooth to the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to the bonnet. Leave strainer cleanout plugs accessible.
6. Provide pre-formed PVC valve and fitting covers.
7. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.
8. Test insulation, jackets and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723 or ASTM E84.
9. Clean thoroughly, test and have approved, all piping and equipment before installing insulation and/or covering.
10. Repair all damage to existing pipe and equipment insulation whether or not caused during the work of this contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.

B. Insulation of Piping:

1. Insulate domestic hot and tempered water with minimum 3-1/2 pounds per cubic foot density fiberglass with ASJ-SSL jacket. Insulation thickness shall be the following:

    a. Pipe 3/4 inches and smaller: 1 inch thick.
    b. Pipe 1 inch through 1-1/2 inches: 1-1/2 inches thick.
    c. Pipe 2 inches and larger: 2 inches thick.

2. Insulate domestic hot water piping under slab on grade with Owens Corning Foamglas, preformed pipe insulation, or equal. Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Cover pipe and fittings with insulation manufacturer’s recommended jacketing. Insulation thickness shall be the following:

    a. Pipe 3/4 inches and smaller: 2 inches thick.
    b. Pipe 1 inch and larger: 3 inches thick.

3. Insulate domestic cold water piping located within building, outside of insulation envelope in outside walls, vented attic spaces, and unheated spaces, including

equipment rooms and below raised floor with 1 inch thick molded fiberglass, minimum 3-1/2 pound per cubic foot density, with ASJ-SSL jacket.

4. Insulate domestic cold water piping located outside building exposed to weather with minimum 3-1/2 pounds per cubic foot density fiberglass with ASJ-SSL jacket. Insulation thickness for all pipe sizes: 2 inches.
5. Insulate roof drain and overflow drain bodies, horizontal sections of rainwater leader piping and overflow piping, and condensate drains within the building envelope with 1 inch thick fiberglass, minimum 3-1/2 pound per cubic foot density, with ASJ-SSL jacket.
6. Insulate condensate drain piping in freezer with 3/4 inch thick Therma-Cel, Armaflex, or equal. Seal water tight per manufacturer's directions. Install heat tape prior to insulation of piping, in accordance with manufacturer's directions.
7. Insulate electrically heat-traced grease waste piping under slab on grade with Owens Corning Foamglas, preformed pipe insulation, or equal. Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Cover pipe and fittings with insulation manufacturer’s recommended jacketing. Insulation thickness for all pipe sizes: 3 inches.
8. Exposed insulated piping within the building shall have a Zeston 2000 25/50, Proto Lo-Smoke, or equal, PVC jacket and fitting cover installed over the insulation, applied per manufacturer's instructions. Insulation shall be vapor tight before applying PVC jacket and fitting covers. Verify suitability with manufacturer of insulation. Insulation with pre-applied polymer jacket may be substituted at Contractor’s option.
9. Where insulated piping is exposed to the weather apply aluminum jacket secured with 1/2 inch stainless-steel bands on 12 inch centers. Insulation shall be vapor tight before applying metal jacket, and aluminum fitting covers. Install jacketing with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Cover fittings with glass cloth, two coats of Foster Sealfas 30-36, and factory-fabricated aluminum fitting covers, of same material, finish, and thickness as jacket. Insulation shall be vapor tight before applying metal jacket and fitting covers.

    a. Fitting covers:

        1) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        2) Tee covers.
        3) Flange and union covers.
        4) End caps.
        5) Beveled collars.
        6) Valve covers.
        7) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

    b. Jacket thickness:

        1) Pipes 10 inches diameter and smaller: Minimum .016 inch thick jacket with smooth finish.

2) Pipes 12 inches diameter and larger: Minimum .020 inch thick jacket with smooth finish.

PART 3 - EXECUTION

3.1 EXISTING MATERIALS

A. Remove existing equipment, piping, wiring, construction, etc., which interferes with Work of this Contract. Promptly return to service upon completion of work in the area. Replace items damaged by Contractor with new material to match existing.

B. Removed materials which will not be re-installed and which are not claimed by Owner shall become property of Contractor and shall be removed from Project site. Consult Owner before removing any material from Project site. Carefully remove materials claimed by Owner to prevent damage and deliver to Owner-designated storage location.

C. Existing piping and wiring not reused and are concealed in building construction may be abandoned in place and all ends shall be capped or plugged. Remove unused piping and wiring exposed in Equipment Rooms or occupied spaces. Material shall be removed from Project premises. Disconnect power, water, gas, pump or any other active energy source from piping or electrical service prior to abandoning in place.

D. Existing piping, ductwork, and equipment modified or altered as part of this Work shall comply with the most recent applicable code requirements.

3.2 FRAMING, CUTTING AND PATCHING

A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.

B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.

C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.

D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.

E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

3.3 PLUMBING DEMOLITION

A. Refer to Division 01 Sections “Cutting and Patching” and “Selective Demolition” for general demolition requirements and procedures.

B. Disconnect, dismantle and remove mechanical systems, equipment, and components indicated to be removed. Coordinate with all other trades.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material. Refrigerant system must be evacuated per EPA requirements.
3. Equipment to Be Removed: Drain down and cap remaining services and remove equipment.
4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.4 ELECTRICAL REQUIREMENTS

A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.

B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.

C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

3.5 PIPING SYSTEM REQUIREMENTS

A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

3.6 PRIMING AND PAINTING

A. Perform priming and painting on the equipment and materials as specified herein.

B. See Division 09 Painting Section(s) for detailed requirements.

C. Priming and Painting:

1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.

a. Black Steel Piping:

1) Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.
2) Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.

2. Metal surfaces of items to be jacketed or insulated except piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the best available grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.
3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

3.7 EXCAVATING

A. Perform all excavating required for work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.

B. Unless shown otherwise, provide a minimum of 2'-6" cover above top of pipe to finished grade for all service piping, unless otherwise noted. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For all PVC pipe and for PE gas pipe, bed the pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. All other materials should have a minimum sand equivalent of 50. Only a small proportion of the native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or

above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such that 100 percent of the material will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.

C. Maintain all warning signs, barricades, flares, and red lanterns as required.

D. For all trenches 5 feet or more in depth, submit copy of permit detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trenches. Obtain a permit from the Division of Industrial Safety prior to beginning excavations. A copy of the permit shall be available at the site at all times.

3.8 BACKFILLING

A. Backfill shall comply with applicable provisions of Division 31 of these Specifications.

B. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.

1. Backfill plastic pipe and insulated pipe with sand for a minimum distance of 12 inches above the top of the pipe. Compact using mechanical tamping equipment.

C. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase the minimum compaction within the uppermost two feet of backfill to 95 percent.

D. Replace or repair to its original condition all sod, concrete, asphalt paving, or other materials disturbed by the trenching operation. Repair within the guarantee period as required.

3.9 PIPING SYSTEMS INSTALLATION

A. At time of final connection, and prior to opening valve to allow pressurization of water and gas piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, or gas pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.

B. General:

1. All piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.

2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.
3. Install piping to permit application of insulation and to allow valve servicing.
4. Where piping or conduit is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
5. Horizontal runs of pipes and/or electrical conduit suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from the Architect.
6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.
7. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.
8. Pipe the discharge of each relief valve, air vent, backflow preventer, and similar device to floor sink or drain.
9. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
10. Install horizontal valves with valve stem above horizontal.
11. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
12. Verify final equipment locations for roughing-in.
13. Service Markers: Mark the location of each plugged or capped pipe with a 4 inch round by 30 inch long concrete marker, set flush with finish grade. Provide 2-1/2 inch diameter engraved brass plate as part of monument marker.
14. Furnish and install anchors or thrust blocks on PVC water lines in the ground, at all changes in direction of piping, and at all connections or branches from mains 1-1/2 inch and larger. Form anchors or thrust blocks by pouring concrete between pipe and trench wall. Thrust blocks shall be of adequate size and so placed as to take thrusts created by maximum internal water pressure. Sizing and placement shall be per manufacturer's recommendations, CPC, and IAPMO installation standards. Anchor piping to building construction.
15. Sanitary Sewer and Storm Drain: Grade piping inside building uniformly 1/4 inch per foot if possible but not less than 1/8 inch per foot. Run piping as straight as possible. Make piping connections between building piping and outside service pipe with cast iron reducers or increasers. Slope sewers uniformly between given elevations where invert elevations are shown.
16. Where piping is installed in walls within one inch of the face of stud, provide a 16 gauge sheet metal shield plate on the face of the stud. The shield plate shall extend a minimum of 1-1/2 inches beyond the outside diameter of the pipe.

C. Expansion Loops:

1. Install expansion loops where piping crosses building expansion or seismic joints, between buildings, between buildings and canopies, and as indicated on Drawings.
2. Install expansion loops of sizes matching sizes of connected piping.
3. Install grooved-joint expansion joints to grooved-end steel piping.

4. Materials of construction and end fitting type shall be consistent with pipe material and type of gas or liquid conveyed by the piping system in which expansion loop is installed.

D. Sleeves:

1. Install Adjus-to-Crete, Pipeline Seal and Insulator, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations as directed shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.
2. At Contractor's option, Link-Seal, Metraflex Metraseal, or equal, casing seals may be used in lieu of caulking. Wrap pipes through slabs on grade with 1 inch thick fiberglass insulation to completely isolate the pipe from the concrete.

E. Floor, Wall, and Ceiling Plates:

1. Fit all pipes with or without insulation passing through walls, floors, or ceilings, and all hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.

F. Firestopping:

1. Pack the annular space between the pipe sleeves and the pipe through all floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.

    a. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.

2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators for each pipe penetration or fixture opening passing through floors, walls, partitions or floor/ceiling assemblies. All Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and in accordance with Chapter 7, CBC requirements.
3. Sleeve penetrators shall have a built in anchor ring for waterproofing and anchoring into concrete pours or use the special fit cored hole penetrator for cored holes.
4. Copper and steel piping shall have SpecSeal plugs on both sides of the penetrator to reduce noise and to provide waterproofing.
5. All above Systems to be installed in strict accordance with manufacturer's instructions.
6. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.

G. Flashing:

1. Flashing for penetrations of metal or membrane roof for mechanical items such as flues and pipes shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.

    a. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
    b. Furnish and install counterflashing above each flashing required. Provide Stoneman, or equal, vandalproof top and flashing combination. Provide vandalproof top for each plumbing vent through roof. Elmdor/Stoneman Model 1540, 1550, 1570, or equal.

2. For all other types of roofing system, furnish and install around each pipe, where it passes through roof, a flashing and counterflashing. All flashing shall be made of four pound seamless sheet lead with 6 inch minimum skirt and steel reinforced boot. Counterflashing shall be cast iron. For vents, provide vandalproof top and flashing combination. Elmdor/Stoneman Model 1100-4, 1100-5, 1100-7, or equal.

H. Hangers and Supports:

1. General: Support equipment and piping so that it is firmly held in place by approved iron hangers and supports and special hangers. Hanger and support components shall support weight of equipment and pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments or hangers, of same size as pipe or tubing on which used, or nearest available. Rigidly fasten hose faucets, fixture stops, compressed air outlets, and similar items to the building construction. The Architect shall approve hanger material before installation. Do not support piping with plumbers' tape, wire rope, wood, or other makeshift devices. Where building structural members do not match piping support spacing, provide “bridging” support members firmly attached to building structural members in a fashion approved by the structural engineer.

    a. Materials, design, and type numbers per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.

        1) Provide copper-plated or felt-lined hangers for use on copper tubing.

2. Hanger components shall be provided by one manufacturer: B-Line, Grinnell, Unistrut, Badger, or equal.
3. Riser clamps: B-line model B3373, or equal.
4. Pipe Hanger and Support Placement and Spacing:

    a. Vertical piping support spacing: Provide riser clamps for piping, above each floor, in contact with the floor. Provide support at joints, branches, and horizontal offsets. Provide additional support for vertical piping, spaced at or within the following maximum limits:

Pipe Diameter	Steel Threaded or Welded (Note 3)	Steel Gas	Copper Brazed or Soldered (Note 3)	CPVC & PVC (Note 2)
1/2 - 1”	12 ft.	6 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
1-1/4 - 2”	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft..	Base and Each Floor (Note 1)
2-1/2 - 3”	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
Over 4”	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)

1) Note 1: Provide mid-story guides.
2) Note 2: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
3) Note 3: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.

b. Vertical cast iron piping support spacing: Base and each floor not to exceed 15 feet.

c. Horizontal piping, hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced at or within following maximum limits:

Pipe Diameter	Steel Threaded or Welded (Note 2)	Steel Gas	Copper Brazed or Soldered (Notes 2, 3)	CPVC & PVC (Note 1)
1/2 - 1"	6 ft.	6 ft.	5 ft.	3 ft.
1-1/4 - 2"	7 ft.	10 ft.	6 ft.	4 ft.
2-1/2 - 3"	10 ft.	10 ft.	10 ft.	4 ft.
Over 4"	10 ft.	10 ft.	10 ft.	4 ft.

1) Note 1: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
2) Note 2: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
3) Note 3: Includes all refrigerant piping, including vapor and hot gas pipes.

d. Horizontal cast iron piping support spacing:

1) Support piping at every other joint for piping length of less than 4 feet.
2) For piping longer than 4 feet, provide support on each side of the coupling, within 18 inches of each joint.
3) Hanger shall not be installed on the coupling.
4) Provide support at each horizontal branch connection.
5) Provide sway brace at 40 foot maximum spacing for suspended pipe with no-hub joints, except where a lesser spacing is required by the seismic design criteria used in delegated design for seismic systems. Refer to Article, Submittals.
6) Provide a brace on each side of a change in direction of 90 degrees or more.

5. Suspended Piping:

a. Individually suspended piping: B-Line B3690 J-Hanger or B3100 Clevis, complete with threaded rod, or equal. All hangers on supply and return piping handling heating hot water or steam shall have a swing connector at point of support.

Pipe Size	Rod Size Diameter
2" and Smaller	3/8"
2-1/2" to 3-1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

b. Trapeze Suspension: B-Line 1-5/8 inch width channel in accordance with manufacturer's published load ratings. No deflection to exceed 1/180 of a span.
c. Trapeze Supporting Rods: Shall have a safety factor of five; securely anchor to building structure.
d. Pipe Clamps and Straps: B-Line B2000, B2400; isolate copper pipe with two thicknesses of 2 inches wide 10-mil polyvinyl tape. Where used for seismic support systems, provide B-Line B2400 series pipe straps.

e. Concrete Inserts: B-line B22-I continuous insert or B2500 spot insert. Do not use actuated fasteners for support of overhead piping unless approved by Architect.
f. Steel Connectors: Beam clamps with retainers.

6. Support to Structure:

a. Wood Structure: Provide and install wood blocking as required to suit structure. Provide lag screws or through bolts with length to suit requirements, and with size (diameter) to match the size of hanger rods required.

1) Do not install Lag screws in tension without written review and acceptance by Structural Engineer.

Side Beam Angle Clip	B-Line B3062---MSS Type 34
Side Beam Angle Clip	B-Line B3060
Ceiling Flange	B-Line B3199

2) Blocking for support of piping shall be not less than 2 inch thick for piping up to 2 inch size. Provide 3 inch blocking for piping up through 5 inch size, and 4 inch blocking for larger piping. Provide support for blocking in accordance with Structural Engineers requirements.
3) Where lag screws are used, length of screw shall be 1/2 inch less than the wood blocking. Pre-drill starter holes for each lag screw.

b. Steel Structure: Provide and install additional steel bracing as required to suit structure. Provide through bolts with length to suit requirements of the structural components. Burning or welding on any structural member may only be done if approved by the Architect.

7. Rubber Neoprene Pipe Isolators:

a. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Refer to Architectural Drawings for location of acoustical walls.
b. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. The rubber shall have between a 45 to 55 durometer rating and a minimum thickness of 1/2 inch.
c. Acceptable Suppliers:

1) Vertical runs: Acousto-Plumb or equal.
2) Horizontal runs: B-Line, Vibraclamp; Acousto-Plumb or equal.

8. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.

9. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.
10. Insulate copper tubing from ferrous materials and hangers with two thicknesses of 3 inch wide, 10 mil polyvinyl tape wrapped around pipe.
11. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.
12. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.

3.10 UNION AND FLANGE INSTALLATION

A. Install Watts, Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel or cast iron pipe or material except in drain, waste, vent, or rainwater piping. Bushings or couplings shall not be used. Dielectric unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 116875.

B. Install unions in piping NPS 2” and smaller, and flanges in piping NPS 2-1/2” and larger whether shown or not at each connection to all equipment and tanks, and at all connections to all automatic valves, such as temperature control valves. Unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 116875.

C. Locate the unions for easy removal of the equipment, tank, or valve.

3.11 ACCESS DOOR INSTALLATION

A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers, traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

3.12 CONCRETE WORK

A. Concrete work required for work of this Section shall be included under another section of the Specification, unless otherwise noted, including poured-in-place concrete work for installing precast manholes, catch basins, etc., and shall include reinforced concrete bases for pumps, tanks, compressors, fan units, boilers, unless the work is specifically indicated on the Drawings to be furnished under this Section.

B. Thrust blocks, underground anchors, and pads for cleanouts, valve access boxes and washer boxes are included under this Section of the Specification. Concrete shall be 3000 psi test minimum. Refer to Division 03 for concrete types.

3.13 PIPE PROTECTION

A. Wrap bare galvanized and black steel pipe buried in the ground and to 6" above grade, including piping in conduit, with one of the following, or equal:

1. Polyethylene Coating: Pressure sensitive polyethylene coating, "X-Tru-Coat" as manufactured by Pipe Line Service Corporation or "Green Line" wrap as manufactured by Roystron Products, or equal.

    a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Roystron Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.

2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-l0 or V-20", "Scotchwrap 50", Slipknot l00, PASCO Specialty & Mfg., Inc., or equal, with continuous identification. Tape shall be a minimum of 20 mils thick for fittings and irregular surfaces, two wraps, 50 percent overlap, 40 mils total thickness. Tape shall be laminated with a suitable adhesive; widths as recommended by the manufacturer for the pipe size. Wrap straight lengths of piping with an approved wrapping machine.

B. Field Joints: Valves and Fittings: double wrap polyvinyl chloride tape as above. Provide at least two thicknesses of tape over the joint and extend a minimum of 4 inches over adjacent pipe covering. Build up with primer to match adjacent covering thickness. Width of tape of fittings shall not exceed 3 inches. Tape shall adhere tightly to all surfaces of the fittings without air pockets.

C. Testing: Test completed wrap of piping, including all epoxy painted piping with Tinker and Rasor Co. test machine (San Gabriel, CA - 818-287-5259), Pipeline Inspection Company (Houston, TX - 713-681-5837), or equal.

D. Cleaning: Clean all piping thoroughly before wrapping.

1. Inspection: Damaged or defective wraps shall be repaired as directed. No wrapped pipe shall be covered until approved by Architect.

E. Sleeve copper piping/tubing installed below slab with “Polywrap-C” polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping and orange for other piping. Install sleeve per manufacturer’s recommendations and instructions.

F. Sleeve copper piping/tubing installed outside building below grade with “Polywrap-C” polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping. Install sleeve per manufacturer’s recommendations and instructions.

G. Sleeve cast iron and ductile iron pipe below grade and below slab with “Polywrap” polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 8 mils thick, colored natural. Install sleeve per manufacturer’s recommendations and instructions.

H. Covering: No rocks or sharp edges shall be backfilled against the wrap or sleeve. When backfilling with other than sand, protect wrap with an outer wrapping of Kraft paper; leave in place during backfill.

3.14 PIPE IDENTIFICATION

A. Provide temporary identification of each pipe installed, at the time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the work.

B. Apply the legend and flow arrow at all valve locations; at all points where the piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with the approval of the Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.

1. Apply legend and flow arrow at approximately 10’-0” intervals in science classrooms and science prep rooms.

C. Wherever two or more pipes run parallel, the markings shall be supplied in the same relative location on each.

D. Each valve on non-potable water piping shall be labeled with a metal tag stamped "DANGER -- NON-POTABLE WATER" in 1/4 inch high letters.

E. Apply markings after painting and cleaning of piping and insulation is completed.

3.15 EXPANSION ANCHORS IN HARDENED CONCRETE

A. Refer to Structural Drawings.

B. Qualification Tests: The specific anchor shall have a current ICC-ES report and evaluated in cracked concrete in accordance with Acceptance Criteria AC193. If the specific anchor satisfies cyclic testing requirements per Acceptance Criteria AC01, Section 5.6, the full allowable shear and tension loads listed in the current ICC-ES report and manufacturer’s recommendations for the specific anchor may be used. Otherwise, the design shear and tension loads shall not be more than 80% of the listed allowable shear and tension loads for the specific anchor.

C. Installation: The anchors must be installed in accordance with the requirements given in ICC Research Committee Recommendations for the specific anchor.

D. Testing: Fifty percent of the anchors shall be load-tested on each job to twice the allowable capacity in tension, except that if the design load is less than 75 pounds; only one anchor in ten need be tested. If any anchor fails, all anchors must be tested. The load test shall be performed in the presence of a special inspector.

E. The load may be applied by any method that will effectively measure the tension in the anchor, such as direct pull with a hydraulic jack, a torque wrench calibrated using the specific anchor or calibrated spring-loading devices. Anchors in which the torque is used to expand the anchor without applying tension to the bolt may not be verified with a torque wrench.

3.16 PIPING SYSTEM PRESSURE TESTING

A. General:

1. Perform operational tests under simulated or actual service conditions, including one test of complete plumbing installation with fixtures and other appliances connected.
2. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

B. Piping Systems: Test piping systems in accordance with the following requirements and applicable codes:

1. Authority having jurisdiction shall witness tests of piping systems.
2. Notify Architect at least seven days in advance of testing.
3. All piping shall be tested at completion of roughing-in, or at other times as directed by Architect.
4. Furnish necessary materials, test pumps, gases, instruments and labor required for testing.
5. Isolate from system equipment that may be damaged by test pressure.
6. Make connections to existing systems with flanged connection. During testing of new work, provide a slip-in plate to restrict test pressure to new systems. Remove plate and make final connection to existing system at completion of testing.

    a. Authority having jurisdiction shall witness final connection to system.

C. Test Schedule: No loss in pressure or visible leaks shall show after four hours at the pressures indicated.

D. Testing of Sanitary Sewer, Drain, Vent, and Storm Drain may be done in segments in order to limit pressure to within manufacturer's recommendations. Test to 10 feet above highest point in the system.

System Tested	Test Pressure PSI	Test With
Sanitary Sewer, Drain, Vent	10 Ft. Hd.	Water
Storm Drain, Condensate Drains	10 Ft. Hd.	Water
Domestic Water	125	Water
Propane (PE)	60	Air & Non-corrosive Leak Test Fluid
Propane (Steel)	100	Air & Non-corrosive Leak Test Fluid

Compressed Air	200 lb.	Air & Non-corrosive Leak Test Fluid
Deionized Water	50	Water

1. Flush deionized water lines with deionized water after test and approval.
2. Non-corrosive leak test fluid shall be suitable for use with piping material specified, and with the type of gas conveyed by the piping system.

3.17 TRACER WIRES

A. Provide tracer wire for non-metallic gas and water pipe in ground outside of buildings. Use AWG #14 tracer wire with low density high molecular weight polyethylene insulation, and lay continuously on pipe so that it is not broken or stressed by backfilling operations. Secure wire to the piping with tape at 18 inch intervals. Solder all joints. Tracer wire insulation shall be colored yellow for gas piping, blue for water piping.

B. Terminals: Precast concrete box and cast iron locking traffic cover, Brooks 3TL, or equal; cover marked with name of service; 6 inches of loose gravel below box. Plastic terminal board with brass bolts; identify line direction with plastic tags. Test for continuity between terminals, after backfilling, in presence of Inspector.

C. Alternate: Use electronically detectable plastic tape with metallic core, Terra Tape D, manufactured by Reef Industries, Inc., Seton, Inc., Marking Services, Inc., or equal; tape 2 inches wide, continuously imprinted "CAUTION WATER (GAS, etc.) LINE BELOW". Install, with printed side up, directly over pipe, 18 inches below finish grade. Backfill material shall be as specified for the particular condition where pipe is installed, but avoid use of crushed rock or of earth with particles larger than l/2 inch within the top 12 inches of backfill. Take precautions to insure that tape is not damaged or misplaced during backfill operations. Terminal boxes not required.

3.18 OPERATION OF SYSTEMS

A. Do not operate any plumbing equipment for any purpose, temporary or permanent, until all of the following has been completed:

1. Complete all requirements listed under “Check, Test and Start Requirements.”
2. Piping has been properly cleaned. Piping systems shall be flushed and treated prior to operation.
3. Filters, strainers etc. are in place.
4. Bearings have been lubricated, and alignment of rotating equipment has been checked.
5. Equipment has been run under observation, and is operating in a satisfactory manner.

B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.

3.19 CHECK, TEST AND START REQUIREMENTS

A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of plumbing equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.

1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.
2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
4. When work has been completed, provide copies of reports for review, prior to final observation of work.

B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.

C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each operating and maintenance manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

3.20 PRELIMINARY OPERATIONAL REQUIREMENTS AND TESTS

A. Prior to observation to determine final acceptance, put all mechanical systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.

1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations.
2. Correct rotation of motors and ratings of overload heaters are verified.
3. Specified filters are installed and spare filters have been turned over to Owner.
4. All manufacturers' certificates of start-up specified have been delivered to the Owner.
5. All equipment has been cleaned, and damaged painted finishes touched up.
6. Missing or damaged parts have been replaced.
7. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.
8. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.

9. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
10. Preliminary test and balance work is complete, and reports have been forwarded for review.
11. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.
12. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.

B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.

1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.
2. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.
3. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.
4. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.

C. Review of Contractor's Tests:

1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.

D. Test Logs:

1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.

E. Preliminary Operation:

1. The Owner reserves the right to operate portions of the plumbing system on a preliminary basis without voiding the guarantee.

3.21 CERTIFICATES OF INSTALLATION

A. Contractor shall complete applicable “Certificates of Installation” forms contained in the California Building Energy Efficiency Standards and submit to the authorities having jurisdiction for approval and issuance of final occupancy permit, as described in the California Energy Code.

3.22 DEMONSTRATION AND TRAINING

A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.

1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.
2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner's representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:

    a. Listing of Owner-designated personnel completing training, by name and title.
    b. Name and title of training instructor.
    c. Date(s) of training.
    d. List of topics covered in training sessions.

4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

END OF SECTION 22 00 50

SECTION 22 10 00

PLUMBING PIPING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Valves.
3. Domestic water piping specialties.
4. Gas piping specialties.
5. Drain and waste piping specialties.
6. Heat tracing.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.3 ACTION SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing piping systems materials and products.

C. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.

D. Shop Drawings: For electric heating cable.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, contactors, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Provide welding certificate for all gas pipe welders.

C. Gas Pipe Installer Qualifications: Provide evidence of current qualifications for individuals performing work requiring qualifications.

1.5 CLOSEOUT SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Maintenance Data: Submit maintenance data and parts lists for plumbing piping systems materials and products. Include this data in Operation and Maintenance Manual.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

1.7 QUALITY ASSURANCE

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Gas Pipe Installer Qualifications: Individuals performing tasks requiring qualifications under Federal and State regulations shall be qualified by the gas utility supplying Project site. The qualifications shall be current at the time of performing the Work.

C. NFPA/ANSI Compliance: Fabricate and install propane gas systems in accordance with latest edition of NFPA 54/ANSI Z223.1 "National Fuel Gas Code."

D. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

E. Fabricate and install gas systems in accordance with California Plumbing Code.

F. Utility Compliance: Fabricate and install propane gas systems in accordance with local gas utility company requirements.

PART 2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS

A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Provide materials and products complying with California Plumbing Code. Where more than one type of material or product is indicated, selection from materials or products specified is Contractor's option.

B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Plastic piping components shall be marked with "NSF-pw."

2.2 PIPE AND FITTINGS ATTACHED TO AND BELOW BUILDINGS INCLUDING 5 FEET FROM BUILDINGS

A. Piping and fittings attached to covered walkways and corridors shall comply with the requirements of this article.

B. Drain and Waste Pipe Above Grade: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard (CISPI) 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler Pipe, or equal. Pipe and fittings shall be the products of a single manufacturer. At Contractor's option, vertical piping above floor from lavatories, sinks, and drinking fountains may be Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV weld pipe and fittings.

1. Joints above grade: No-Hub pipe conforming to ASTM A888 and CISPI 301. Couplings conforming to ASTM 1277 and CISPI 310, with stainless steel bands. Provide products by ANACO-Husky, Tyler, Ideal or equal. Provide sway brace at 20'-0" maximum spacing for suspended pipe with No-Hub joints. Provide a brace on each side of a change in direction of 90 degrees or more. Brace riser joints at each floor and at 15 foot maximum intervals (also see Specification Section 22 00 50).

C. Drain and Waste Pipe Below Grade: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and CISPI 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler Pipe, or equal. Pipe and fittings shall be the products of a single manufacturer. At Contractor's option, hub and spigot cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A-74 and so marked, may be used.

1. Joints below grade: ANACO-Husky SD 4000, Clamp-All 125, or equal couplings and No-Hub fittings, meeting the requirements of FM 1680, SD Class I and ASTM C1540.
2. Joints below grade (hub and spigot option): Neoprene gaskets conforming to ASTM C564, as manufactured by Ty-Seal, Dual-Tite, or equal.

D. Vent Pipe:

1. 3 inch and larger: Cast iron soil pipe and fittings conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Joints in cast iron vent pipe shall be the same as specified for cast iron waste pipe above grade.
2. 2-1/2 inch and smaller: Cast iron soil pipe and fittings as specified for sizes 3 inch and larger, Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV copper pipe and fittings.
3. Vent pipe buried in ground and to 6 inches above ground: Cast iron soil pipe and fittings conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Joints in cast iron vent pipe shall be the same as specified for cast iron waste pipe below ground.

E. Type DWV copper tubing or No-Hub cast iron pipe and fittings may be used for concealed rainwater leaders. Where no-hub piping is used, the fittings and couplings shall match those used for waste piping.

F. Grease Waste (GW) and Vent (GV) Pipe Underground to 6 Inches Aboveground: George Fisher Sloane, Inc., “Fuseal PP,” Orion Fittings, Inc., “Rionfuse CF,” IPEX, Inc., “Enfield,” or equal, Schedule 40 polypropylene pipe and fittings assembled with electrofusion joints. Piping shall comply with ASTM F1412.

G. Grease Waste (GW) and Vent (GV) Pipe Aboveground:

1. In inaccessible spaces or within walls, George Fisher Sloane, Inc., “Fuseal PP,” Orion Fittings, Inc., “Rionfuse CF,” IPEX, Inc., “Enfield,” or equal, flame-retardant schedule 40 polypropylene pipe and fittings assembled with electrofusion joints. Piping shall comply with ASTM F1412.
2. In accessible areas: George Fisher Sloan, Inc. “Fuseal PP,” Orion Fittings, Inc. “Blueline,” IPEX, Inc. "Labline," or equal, flame retardant Schedule 40 polypropylene drainage pipe and fittings, with mechanical joints. Piping shall comply with ASTM F1412.
3. Vent pipe aboveground: 3 Inches and Larger: Service weight cast iron soil pipe and fittings; 2-1/2 inches and smaller: Schedule 40 galvanized steel pipe with black cast iron drainage fittings.

H. Water Pipe (Tempered Water, Tempered Water Return, Hot Water, Hot Water Return and Cold Water): ASTM B88, Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass. Water piping below slab: ASTM B88, Type K copper tubing, hard temper, with wrought copper fittings. At Contractor’s option, pipe runs below slab having no branches may be ASTM B88, Type K annealed copper tubing without joints. See Section 22 00 50 for pipe protection requirements for below slab copper piping.

I. Temperature and Pressure Relief Valve Piping: ASTM B88, Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass.

J. Gas Pipe: Schedule 40 black steel conforming to ASTM A53, with malleable iron threaded fittings above grade for piping 2 inch and smaller; welded piping below grade and for above grade piping larger than 2 inches, with Class 150 welding fittings.

1. Appliance Flexible Connectors for Indoor Equipment Without External Spring Isolation:

a. Contractor may choose one of the following:

1) Direct gas pipe connection.
2) Appliance flexible connector:

a) Comply with ANSI Z21.24.

b) Polymer or hot-dipped PVC coated corrugated 304 stainless steel.
c) Operating-Pressure Rating: 0.5 psig.
d) End Fittings: Zinc-coated steel.
e) Maximum Length: 30 inches.
f) Manufacturers: Dormont, Series 30C, 31, 40C, 41, and 51, Brasscraft model ProCoat, or equal.

b. Provide with end connections compatible with equipment and piping system.
c. Equipment located in spaces normally accessible to building occupants, other than maintenance personnel, shall utilize direct gas pipe connection.
d. Provide anti-microbial PVC coating for use with appliances located in kitchen areas.

2. Flexible Gas Connector for Outdoor Equipment Without External Spring Isolation:

a. Contractor may choose one of the following:

1) Direct gas pipe connection.
2) Corrugated stainless steel hose with 304 stainless steel braid covering, CSA certified. Metraflex model GASCT, Unisource Manufacturing series 400, or equal. Provide with end connections compatible with equipment and piping system.

3. Flexible Gas Connector for Equipment with External Spring Isolation, Indoors and Outdoors:

a. Where Drawings indicate installation of mechanical equipment on spring isolation rails spring mounted curbs, or spring hangers, provide metal flexible connectors, Metraflex Metraloop, or equal by Unisource Mfg. Co., or Flexicraft Industries, CSA certified for 4 inches of movement in all directions.

4. Flexible Gas Connection System for Movable Gas-Fired Cooking Equipment:

a. System shall include flexible PVC coated braided stainless steel hose, quick disconnect fitting, full port CSA certified ball valve, 2 swivel elbows, coiled steel restraining cable and mounting hardware. Assembly shall be certified per ANSI Z21.69/CSA 6.16, “Connectors for Movable Gas Appliances.” Size as required for appliance connection, 48” minimum hose length. Install per manufacturer’s instructions. Connectors shall be Dormont Safety System, T&S Safe-T-Link, or equal.

K. Condensate Drain Piping:

1. Inside buildings provide ASTM B88, Type L copper tubing and fittings. Provide Wye fittings with capped cleanout plug for tubing up to 1 inch size. Provide wrought or cast DWV fittings for sizes 1-1/4 inch and larger.

2. Outside buildings provide ASTM B88, Type L copper pipe and fittings, cast iron drain pipe and fittings or Schedule 40 galvanized steel pipe and cast iron drain or vent fittings.
3. Connect condensate drains to mechanical equipment per equipment manufacturer's recommendations; provide P-trap where required. Slope piping to drain, with 1 inch in 10 foot minimum pitch. Provide di-electric couplings or unions at connections to dissimilar materials.
4. Where Drawings indicate installation of mechanical equipment on spring isolation rails spring mounted curbs, or spring hangers, provide threaded metal connector at mechanical equipment, Metraflex Model SST, or equal by Unisource Mfg. Co., or Flexicraft Industries. Arrange flexible connection to ensure drainage of condensate, and support flexible connection at each end of connector, to ensure proper alignment.
5. Where condensate drain P-traps are required, install trap using Wye fitting on inlet and outlet of trap. Provide cap on top of each Wye, made removable for cleaning and inspection. Drill 1/8 inch diameter hole in cap at outlet of the trap to allow venting of the system. Minimum depth of trap should be 4 inches, or as recommended by the manufacturer in printed literature.
6. Provide cleanout tees or “Y” at each change in direction.

L. Condensing-Type Equipment Condensate Drain Pipe: CPVC pipe and fittings conforming to ASTM D-2846.

1. Provide CPVC condensate drain pipe for condensing water heaters, furnaces, and where shown on Drawings.
2. Piping and fittings shall be as manufactured by Spears Manufacturing, Charlotte Pipe and foundry Co., or equal.

M. Deionized Water Piping:

1. Polyvinylidene Fluoride (PVDF) Pressure Rated Pipe and Fittings: Schedule 80 PVDF pressure rated pipe and fittings. Pipe and fittings shall meet ASTM D-1785. Threaded fittings shall comply with ASTM D-2464. The pipe and fittings shall be sterilized and capped or packaged immediately after production and all seals shall be intact when the material is delivered to the jobsite.

2. Provide continuous channel support under all horizontal piping, B-line, Grinnell, or equal PVC coated channel systems, series B11 through B72 with matching pipe clamps as appropriate, or equal.

2.3 SITE PIPING AND FITTINGS TO 5 FEET FROM BUILDINGS

A. Buried Drain, Waste, and Vent Piping:

1. Install piping from street connection to the property line in accordance with local requirements.
2. 4 inches and larger: PVC, ASTM D3034 - SDR 35; use matching Ring Tite fittings.
3. 3 inches and smaller: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so

marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler pipe, or equal. Provide ANACO-Husky SD 4000, Clamp-All 125, or equal couplings and No-Hub fittings, meeting the requirements of FM 1680, SD Class I and ASTM C1540. Pipe and fittings shall be the product of a single manufacturer.

B. Grease Waste (GW) and Vent (GV) Pipe: George Fisher Sloane, Inc., “Fuseal PP,” Orion Fittings, Inc., “Rionfuse CF,” IPEX, Inc, “Enfield,” or equal, polypropylene pipe and fittings assembled with electrofusion joints. Piping shall comply with ASTM F1412.

C. Water Service Piping:

1. Sizes 2 inches and larger (not under building): Gasket style PVC conforming to ASTM D2241-SDR21, Class 200 with gasket type fittings or ductile iron mechanical joint couplings. Gasket fittings shall be one piece injection molded PVC fittings, equal to Flo-Seal water main fittings for PVC pressure pipe, 200 psi, ASTM D-3139.
2. Sizes less than 2 inches: Type K copper tubing, hard temper, with wrought copper fittings. See Section 22 00 50 for pipe protection requirements for below grade copper piping.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

    a. J.M. Eagle.
    b. P.W. Pipe.
    c. Ipex Series Pipe.

D. Water Service Piping Above Grade:

1. Sizes 3 inches and larger: Class 150 flanged ductile cast iron water pipe conforming to AWWA/ANSI C150/A21.50 and manufactured in accordance with AWWA/ANSI C151/A21.51. Fittings shall conform to AWWA/AWWA C110/A21.10, Class 250 pattern. Pipe and fittings shall have factory applied cement-mortar lining in accordance with AWWA/ANSI C104/A21.4. Flanges shall conform to ASME/ANSI B16.1.
2. Piping 2-1/2 inches and smaller: Type K copper tubing, hard temper, with brazed wrought copper fittings.

E. Gas Piping Underground: Performance Pipe, “DriscoPlex” 6500 PE 2708 (yellow), Polypipe, Inc., “Polypipe”, or equal, polyethylene gas distribution pipe, ASTM D2513, ASTM D3261, and ASTM D2683 fittings with fusion welded joints. Provide piping labeled for gas in accordance with CPC.

1. Electrically isolate underground ferrous gas piping from the rest of the gas system with listed or approved isolation fittings installed a minimum of six inches above grade.
2. Provide Central Plastics Corp., Perfection, or equal, anodeless, single seal riser for transition from below grade polyethylene to schedule 40 steel piping above grade. Minimum horizontal length shall be 30 inches. Minimum vertical length shall be 30 inches, or greater as required. Provide fusion connection to

polyethylene pipe below grade, and screwed connection to steel pipe above grade.

F. Gas Piping Aboveground to 30 inches Belowground: Schedule 40 black steel with beveled ends for welding, with Class 150 welding fittings. Mitering to form elbows or tees will not be permitted; where branch tee connections of welded piping are required, Bonney "Weldolet" Allied Pipe Fittings, or equal fittings may be used if the branch is one-half of the diameter of the main or less.

G. Drainage Pipe, Perforated or Un-perforated: J-M PVC, P.W. Pipe, or equal drainage pipe and fittings or non-reinforced concrete sewer pipe ASTM C14.

H. Pool Piping:

1. PVC Pipe: ASTM D 1785, Schedule 40.
2. PVC Socket Fittings: ASTM D 2466 for Schedule 40.

2.4 FIRE PROTECTION PIPING

A. Refer to specification Section 21 10 00 “Fire Protection.”

2.5 PIPE JOINING MATERIALS

A. Refer to piping Articles in this Section for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated

a. Full-Face Type: For flat-face, Class 125, cast iron and cast bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast iron and steel flanges.

2. AWWA C111, rubber, flat face, 1/8-inch (3.2mm) thick, unless otherwise indicated; and full-face or ring type, unless other indicated.
3. Flange Bolts and Nuts: AWWA C111, carbon steel, unless otherwise indicated.
4. Plastic, Pipe-Flange Gasket, Bolts and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, 100 percent lead free alloys. Include water-flushable flux according to ASTM B813.

D. Brazing Filler Metals: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.

E. Welding Filler Metals: Comply with ASME B31.1 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.6 VALVES AND FITTINGS FOR POTABLE WATER SYSTEMS

A. General:

1. Provide valves and fittings conforming to lead-free requirements of California Health and Safety Code Section 116875.

    a. Provide valves listed to NSF/ANSI 61-G or NSF/ANSI 372 for valve materials for potable-water service.

        1) Exception: Main distribution gate valves above 1-1/2 inches located underground outside building are not required to conform lead-free requirements of California Health and Safety Code Section 116875.

B. Gate Valves:

1. General: Furnish valves in copper lines with adapters to suit valve/line requirements.
2. 1-1/2 inches and smaller: Minimum 200 psi CWP, bronze body, threaded bonnet, rising or non-rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Milwaukee UP148, UP149, Nibco T-113-LF, S-113-LF, or equal.
3. 2 inches through 3 inches: Minimum 200 psi CWP, bronze body, threaded bonnet, non-rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Nibco T-113-LF, S-113-LF, or equal.
4. Main distribution gate valves underground outside building above 1-1/2 inches:

    a. Underground valves 2 inches thru 12 inches: 250 psi, iron body, Non-rising stem, bolted bonnet, resilient wedge valves, conforming to AWWA C509, equipped with operating nuts, Mueller Series 2360, Nibco F-619-RW-SON, or equal.

        1) Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
        2) Furnish and deliver to Owner one wrench of each size required for operating underground valves.

C. Ball Valves:

1. 2 inches and smaller: 600 psi CWP, cast bronze or brass body, full port, two piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco T-685-80-LF, Milwaukee UPBA400, Apollo 77C-LF10, Kitz 868, or equal.
2. 2-1/2 inches: Apollo 77C-LF10, or equal.

D. Swing Check Valves:

1. Minimum 200 psi CWP, bronze or brass body, suitable for regrinding, threaded ends, conforming to MSS SP-80. Milwaukee UP509, Nibco T-413LF, Kitz 822T, or equal.

E. Butterfly Valves:

1. General: Tight closing, full lug type, with resilient seat suitable for minimum working pressure of 200 psig, conforming to MSS SP-67. Bi-direction dead end service with downstream flange removed.
2. Provide valves with the following:

    a. Seats: suitable for 40 degrees F for cold water service and 250 degrees F for hot water service. Seats shall cover inside surface of body and extend over body ends.
    b. Bodies: ductile iron or cast iron.
    c. Discs: Bronze or stainless steel.
    d. Stems or Shafts: Stainless steel. Install valves with stems horizontal.
    e. Control Handles: Suitable for locking in any position or with 10 degree or 15 degree notched throttling plates to hold valve in selected position. Provide extended necks to compensate for insulation thickness. Provide gear operator for valves 5 inches and larger.

3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

    a. 2 through 12 inches: Watts Regulator Co., model DBF-03.

F. Silent Check Valves (for use on pump discharge):

1. General: Provide spring loaded check valves at pump discharge of all pumps.

    a. 2 inches and smaller: Minimum 300 psi CWP, bronze body, Apollo 61LF, Milwaukee UP548-T, or equal.
    b. 2-1/2 inches and larger: Class 250, cast iron body, suitable for regrinding, Mueller 103MAP, or equal.

G. Calibrated Balancing Valves:

1. General: Calibrated orifice ball type rated for 400 psig maximum operating pressure and 250 degrees F. maximum operating temperature.

    a. Body: Brass.
    b. Ball: 304 Stainless Steel.
    c. Seat: Glass and Carbon filled TFE.
    d. End Connections: Threaded.
    e. Pressure Gage connections: Integral capped readout valves with internal check valves and drain port, for use with portable pressure differential meter.
    f. Handle Style: Dial, with memory stops to retain set position.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

    a. 3 Inch and Smaller: Bell & Gossett model CB, “LF” series.

2.7 VALVES AND FITTINGS FOR NON-POTABLE WATER, COMPRESSED AIR, AND GAS SYSTEMS

A. Gate Valves:

1. 2-1/2 inches and smaller: Class150, bronze body, union bonnet, rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Hammond IB641, IB648, Nibco T-134, S-134, Milwaukee 1151, 1169, or equal.
2. 3 inches and larger: Class 125, iron body, bronze mounted, bolted bonnet, non-rising stem, solid wedge, flanged ends, conforming to MSS SP-70. Hammond IR-1138, Nibco F619, Milwaukee F2882A, Stockham G-612, or equal.
3. Underground valves 2 inches thru 12 inches: 250 psi, iron body, Non-rising stem, bolted bonnet, resilient wedge valves, conforming to AWWA C509, equipped with operating nuts, Mueller Series 2360, Nibco F-619-RW-SON, or equal.

    a. Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
    b. Furnish and deliver to Owner one wrench of each size required for operating underground valves.

B. Ball Valves:

1. 2 inches and smaller: 600 psi CWP, 150 psi SWP, cast bronze body, full port, two piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco T585-70, Milwaukee BA-400, Stockham T-285, or equal.
2. 2-1/2 inches and larger: Class 150, carbon steel body, full port, two piece, stainless steel vented ball, flanged ends, and reinforced PTFE seal, conforming to MSS SP-72. Nibco F-515-CS-F-66-FS, Milwaukee F20-CS-15-F-02-GO-VB, or equal.
3. Compressed Air Services: 600 psi CWP, 150 psi SWP, bronze body, full port, three piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco Model T-595-Y, Milwaukee BA-300, or equal.

C. Swing Check Valves: Class 125 or 150, bronze body, suitable for regrinding, threaded ends, conforming to MSS SP-80. Stockham B-321, Milwaukee 509, Nibco T-433, or equal.

D. Butterfly Valves:

1. General: Tight closing, full lug type, with resilient seat suitable for minimum working pressure of 200 psig, conforming to MSS SP-67. Bi-direction dead end service with downstream flange removed.
2. Provide valves with the following:

    a. Seats: Suitable for 40 degrees F for cold water service and 250 degrees F for hot water service. Seats shall cover inside surface of body and extend over body ends.
    b. Bodies: Ductile iron or cast iron.
    c. Discs: Bronze or stainless steel.
    d. Stems or Shafts: Stainless steel.

e. Control Handles: Suitable for locking in any position or with 10 degree or 15 degree notched throttling plates to hold valve in selected position. Provide extended necks to compensate for insulation thickness. Provide gear operator for valves 5 inches and larger.

3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. 2 through 12 inches: Milwaukee Valve, CL series, Nibco, Inc., Model LD2000-3, or equal.

E. Silent Check Valves (for use on pump discharge):

1. General: Provide spring loaded check valves at pump discharge of all pumps.
2. 2 inches and smaller: 250 psi CWP, bronze body, Nibco Model T-480, Milwaukee 548-T, or equal.
3. 2-1/2 inches and larger: Class 250, cast iron body, wafer style, suitable for regrinding. Nibco Model F960, Milwaukee 1400, Mueller 103MAP, or equal.

F. Calibrated Balance Valves (Symbol CBV): Provide globe style valves for precision regulation and control rated 175 psi for sizes 2-1/2 inches through 12 inches and rated 240 psi for bronze sizes 2 inches and below. Each valve shall have two metering/test ports with internal check valves and protective caps. All valves must be equipped with visual position readout and concealed memory stops for repeatable regulation and control.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. Bell & Gossett Circuit Setter Plus.
b. Armstrong CBV.
c. Flow Design Inc. Accusetter.
d. Tour & Andersson.
e. Circuit Sensor with butterfly valve above 3 inches.
f. Illinois Series 5000 through 2 inches.

G. Flow Control Valves: Automatic pressure compensating flow control valves shall be Griswold, Flow Design, Inc., or equal.

H. Building Gas Shut-Off Valves:

1. 2 inches and smaller: Provide 175 psi SWP ball valve, CSA listed, full port, lockwing type, with AGA painted grey finish. Jomar 175-LWN, or equal.
2. Above 2 inches: Provide ReSun D-126, Key Port, or equal, lubricated plug cock, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes.

Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.

3. Provide valves same size as upstream piping. Make any reduction in size of gas piping downstream of shutoff valves.

I. Gas Shut-off Valve Above Grade:

1. 2 inches and smaller: Provide Milwaukee BB2-100, Jomar T-100NE, or equal, ball valve, CSA listed, full port.
2. Above 2 inches: Provide ReSun D-126, Key Port, or equal, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes. Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.
3. Provide valves same size as upstream piping. Make any reduction in size of gas piping downstream of shutoff valves.

J. For Gas Service Below Grade:

1. Lubricated plug cocks: ReSun Model D-126, Key Port, or equal, lubricated plug cock, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide extended lubrication stem, arranged to allow for lubrication of the valve from grade. The extension must be constructed to allow for lubrication of the valve and for operation of the valve from grade. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes. Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.

    a. Provide flanged ends on valves installed below grade. Connect to polyethylene piping with flanges and stainless steel bolts.
    b. Anchor each valve flange to valve box with welded angle iron, or provide vertical stiff leg, minimum 18 inches into earth.
    c. Provide Central Double O Seal Transition Fittings, or equal, flanged style for connection between valve and piping system.
    d. Wrap valve, flanges and exposed pipe with PASCO Specialty & Mfg., Inc., or equal tape wrap, installed in accordance with requirements listed under “Pipe Protection”.

2. Molded polyethylene body ball valves: Nordstrom Valves - Polyvalve II for sizes 1-1/4 inches to 2 inches, and Polyvalve for sizes 2 inches and larger, or equal. Valves 1 inch and smaller shall be listed lubricated plug cocks, with transition fittings..

    a. Provide stub ends to match SDR of the piping, arranged for butt fusion welding. Provide valve body material to suit the adjacent piping system.
    b. Provide wrench to suit the valve operator.

K. Seismic Gas Shut-Off Valves: Certified by State of California and compliant with ASCE 25. Provide standard or high pressure model as required to match site gas pressure. Provide unit arrangement per Drawings schedule and details.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Little Firefighter Corporation, models NAGV, VAGV, and AGV.
b. Seismic Safety Products, LLC, Northridge series.

2.8 DOMESTIC WATER PIPING SPECIALTIES

A. Hose Bibbs:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:

a. Acorn Engineering Co.
b. Woodford Manufacturing Co.

2. Hose Station: Leonard THS-25-VB-CW, Symmons, or equal.

B. Wall Hydrants:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:

a. Acorn Engineering Co.
b. Woodford Manufacturing Co.
c. Mifab, Inc.

C. Water Hammer Arrestors:

1. Provide water hammer arrestors conforming to lead-free requirements of California Health and Safety Code Section 116875, with nesting type bellows contained within a casing having sufficient displacement volume to dissipate the calculated kinetic energy generated in the piping system. Water hammer arrestors shall be sized for type and number of fixtures served. Provide all stainless steel shell construction with stainless steel bellows and threaded connection to water system.
2. Water hammer arrestors shall be certified under P.D.I. Standard WH201 and by ASSE Standard 1010.
3. Select units in accordance with the requirements of Plumbing and Drainage Institute Standard P.D.I. WH201. Install above ceilings or behind wall access door at each plumbing fixture, or where plumbing fixtures are installed in groups, at each group of fixtures.

4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

    a. Josam Company, series 75000.
    b. Smith (Jay R.) Mfg. Co., Hydrotrol 5005-5050.
    c. Mifab, series WHB.

D. Water Filters:

1. Provide Cuno Incorporated, Aqua Pure model AP510, or equal, point of use water filters, conforming to lead-free requirements of California Health and Safety Code Section 116875, in locations indicated on Drawings.

    a. Provide model AP517 filter cartridge at each location, with 5 micron rating and 2,000 gallon rating, to remove sediment, rust, scale and chlorine taste and odor from incoming water. 2 gallon per minute capacity.
    b. Provide one spare cartridge for each unit provided.

E. Reduced Pressure Backflow Preventers for Potable Water Systems:

1. Provide reduced pressure principle backflow preventer conforming to lead free requirements of California Health and Safety Code Section 116875.

    a. Reduced-pressure principle backflow preventer assembly, consisting of shutoff valves on inlet and outlet, and strainer on inlet., Backflow preventer shall include test cocks, and pressure differential relief valve located between two positive seating check valves. Construct in accordance with ASSE Standard 1013.
    b. Manufacturers: Subject to compliance with requirements and local water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

        1) 2 inches and smaller: Wilkins 975XL2, Febco LF825YRP, Watts LF919.
        2) 2-1/2 thru 10 inches: Wilkins 475AXL, Febco LF860RP.
        3) 2-1/2 and 3 inches: Watts LF009.

2. Provide LeMeur, Hot-Box, WattsBox, or equal, two piece reinforced aluminum, fiberglass, welded angle with expanded metal, backflow preventer enclosure, sized to suit the size of backflow preventer. Install on concrete pad, in accordance with manufacturer's written installation instructions.
3. Provide substantial padlock and chain to lock valves in open position, and turn key over to Project Inspector.

    a. Padlocks shall be as specified under Section 08 70 00.
    b. Chain shall be of carbon steel, 3/8 inch wire diameter, fully welded links and weight of 140 pounds per 100 lineal feet. Chain shall be hot galvanized.

4. Provide capped connections at each test cock. Install in accordance with requirements of Authority Having Jurisdiction.
5. For units installed within buildings, provide drain, connected to unit, to collect spillage from atmospheric vent. Run drain to nearest floor sink or drain.
6. Provide two concrete filled, 6-inch diameter pipe bollards to protect all exposed piping from motor vehicle damage.

F. Reduced Pressure Backflow Preventers for Non-Potable Water Systems:

1. Refer to Section 211000 for backflow preventers for fire protection service.
2. Provide reduced-pressure principle backflow preventer consisting of assembly, including shutoff valves on inlet and outlet, and strainer on inlet, equal to Febco 825Y or 880, as required Wilkins, Aames, or equal. Backflow preventer shall include test cocks, and pressure differential relief valve located between two positive seating check valves. Construct in accordance with ASSE Standard 1013.
3. Provide LeMeur, Hot-Box, or equal, two piece backflow preventer enclosure, sized to suit the size of backflow preventer. Install on concrete pad, in accordance with manufacturer's written installation instructions.
4. Provide substantial padlock and chain to lock valves in open position, and turn key over to Project Inspector.

    a. Padlocks shall be as specified under Section 08 70 00.
    b. Chain shall be of carbon steel, 3/8 inch wire diameter, fully welded links and weight of 140 pounds per 100 lineal feet. Chain shall be hot galvanized.

5. Provide capped connections at each test cock. Install in accordance with requirements of Authority Having Jurisdiction.
6. For units installed within buildings, provide drain, connected to unit, to collect spillage from atmospheric vent. Run drain to nearest floor sink or drain.
7. Provide two concrete filled, 6-inch diameter pipe bollards to protect all exposed piping from motor vehicle damage.
8. Manufacturers: Subject to compliance with requirements and local water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

    a. Ames.
    b. Febco Sales, Inc.
    c. Watts Regulator Company.
    d. Clow.

G. Double Check Valve Backflow Preventers:

1. Refer to Section 211000 for backflow preventers for fire protection service.
2. Provide double detector check valve assembly consisting of two spring loaded brass check valves, two cast iron bronze fitted gate valves and four test cocks, equal to Febco Model 856 or 876 as required. Construct in accordance with ASSE Standard 1048.

3. Provide LeMeur, Hot-Box, or equal, two piece backflow preventer enclosure, sized to suit the size of backflow preventer. Install on concrete pad, in accordance with manufacturer's written installation instructions.
4. Provide substantial padlock and chain to lock valves in open position and turn key over to Project Inspector.

    a. Padlocks shall be as specified under Section 08 70 00.
    b. Chain shall be of carbon steel, 3/8 inch wire diameter, fully welded links and weight of 140 pounds per 100 lineal feet. Chain shall be hot galvanized.

5. Provide capped connections at each test cock. Install in accordance with requirements of Authority Having Jurisdiction.
6. Provide two concrete filled, 6 inch diameter pipe bollards to protect all exposed piping from motor vehicle damage.
7. Provide Christy, or equal, utility box sized as required to suit backflow assembly, complete with two piece reinforced concrete lid, concrete extensions, insulation and other construction details shown on the drawings.
8. Manufacturers: Subject to compliance with requirements and local water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

    a. Ames.
    b. Febco Sales, Inc.
    c. Watts Regulator Company.
    d. Clow.

H. Potable Water Pressure-Regulating Valve:

1. Provide pressure-regulating valves, single-seated, direct-operated type, bronze body, integral strainer, complying with requirements of ASSE Standard 1003, and the lead-free requirements of California Health and Safety Code Section 116875. Size for maximum flow rate and inlet and outlet pressure indicated on Drawings.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

    a. Cla-Val Company.
    b. Watts Regulator Company.

I. Thermostatic Water Temperature Control Valve:

1. Provide thermostatic water temperature control valve conforming to lead free requirements of California Health and Safety Code Section 116875, with size as noted on Drawings, complete with union angle strainer checkstops. Valves shall be thermostatic type, with a maximum temperature setting as follows:
2. Provide surface recessed semi-recessed mounted, white enameled or stainless steel cabinet with locking door for control valves. Including:

a. Control valve cabinet and valve shall be provided as a package, and include thermostatic water mixing valve, thermometer, safety checkstops, volume control valve and internal piping.

3. Where indicated on drawings, provide a temperature alarm system, utilizing a micro-processor based controller and solid state temperature controller. Provide audible and visual indication of high and low temperature set points. Provide required hardware and wiring for a complete operating system.

a. Provide isolation transformer for control of the alarm system.
b. Provide solenoid valve and shock absorber, installed and wired to the alarm module.

4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. Leonard Valve Company.
b. Lawler Manufacturing Co., Inc.
c. Powers.

J. Relief Valves:

1. Provide relief valves as indicated, of size and capacity as selected by Contractor for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code.
2. Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI A21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210 degrees F, and pressure relief at 150 psi.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. Watts Regulator Company.
b. Cash (A.W.) Valve Manufacturing Corporation.
c. Zurn Industries, Inc.; Wilkins-Regulator Division.

K. Trap Primers:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:

a. MiFab, Inc.
b. Precision Plumbing Products.
c. Sioux Chief Manufacturing Company.

L. Water Meter:

1. Provide and install prefabricated water meter and bypass assembly, sized as indicated on the Drawings, complete with strainer, adapter, couplings, spool piece and test nipple. The meter shall be compound type, with two measuring chambers and a single billing register. Pipe materials used in construction of the assembly shall be ductile iron, and the meter shall be bronze with stainless steel trim.
2. Install the meter and accessories in a Christy, Brooks, or equal, series "R" pit Model R37, 4 feet by 7 feet by 3 feet deep; complete with 4 piece checker plate parkway lid (screw down type), and 8 inch round meter reading lid. Install meter in accordance with the requirements of the Authority Having Jurisdiction.
3. Manufacturers: Subject to compliance with requirements and local water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

    a. Badger Meter, Inc.
    b. Sensus North America Water.
    c. Neptune Technology Group.
    d. Hershey Meters.

2.9 GAS PIPING SPECIALTIES

A. Gas Pressure Regulating Valves:

1. Provide single-stage, spring-loaded, corrosion-resistant gas pressure regulators, with die-cast aluminum or cast iron body, complying with ANSI Z21.80. Unit shall be with atmospheric vent, internal relief overpressure protection, threaded ends for 2 inches and smaller, flanged ends for 2-1/2 inches and larger. For inlet and outlet gas pressures, specific gravity, and volume flow refer to Drawings schedule.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

Size	Manufacturer/Model
1/2 inch	Elster (American, Singer) model 1213B Itron (Actaris, Slumberger, Sprague) model B42R.
3/4 thru 1-1/4inches	Elster (American, Singer) model 1813C Sensus (Ivensys, Equimeter, Rockwell) model 143-80-12 Itron (Actaris, Slumberger, Sprague) models B42R, B57R, B58R
1-1/2 thru 2 inches	Elster (American, Singer) models 1813, 1813B Sensus (Ivensys, Equimeter, Rockwell) model 243

	Itron (Actaris, Slumberger, Sprague) models B43SR, B34R, B38R

B. Gas and Air Outlets:

1. Gas Outlets: Deck mounted Chicago 982-907BC duplex, T&S Brass, or equal; deck mounted Chicago 980-907BC single, or equal, deck-mounted Chicago 984-907BC, four outlets, or equal. Provide integral check valve, and single lever handle in compliance with ADA requirements.
2. Air Outlets: Panel mounted Chicago 986-937CH; deck-mounted Chicago 980-937CH, T&S Brass, or equal. Provide integral check valve, and single lever handle in compliance with ADA requirements.
3. Air Hose Valve: Lincoln 815 coupler and 11659 nipple, Grover, or equal, with ball valve on inlet. Refer to drawing details for additional requirements. Provide Wilkerson Model CB6-04-000 air pressure regulator, or equal.
4. Hose Reels: Lincoln Model 85062, Grover or equal. Provide heavy-duty type with delivery hose, universal swivel, ball stop, shut-off valve, control valve and filter as required. Connect services to reels with ball valve.

2.10 DRAIN AND WASTE PIPING SPECIALTIES

A. Cleanouts:

1. General: Install cleanouts of same diameter as pipe (4 inch maximum) in all horizontal soil and waste lines where indicated and at all points of change in direction. Cleanouts shall be located not less than 18 inches from building construction so as to provide sufficient space for rodding. No horizontal run over 50 feet inside buildings or 100 feet outside buildings shall be without cleanout, whether shown on Drawings or not. Provide two-way cleanouts where indicated on drawings, and where required for satisfactory use.

    a. Provide cleanouts in waste drop from each sink and urinal.
    b. Provide one wrench for each size and type of cleanout used. Turn over to Owner at completion of the project, and obtain receipt. Place receipt in Operation and Maintenance Manuals.

2. Cleanouts in floor and in concrete sidewalks: Ducco Cast Iron with nickel bronze top, clamping collar and ABS plastic plug: Zurn ZN-1400-KC, or equal, with square or round top to suit floor construction.
3. Cleanouts in composition floors: Zurn ZN-1400-X-DX, or equal (nickel bronze top).
4. Cleanouts in concealed, aboveground cast-iron soil or waste lines: Zurn Z-1440A, or equal, with ABS plastic plug.
5. Cleanouts in walls: Zurn Z-1441 or Z-1443, or equal, with stainless steel cover. Provide long sweep elbow or combination wye at connection to riser and install with surface of cleanout within ½ inch of front face of finished wall.

a. Where space does not permit the above installation, provide Zurn Z-1446, or equal, with stainless steel access cover, and vandal resistant screw.
b. Install face of cleanout plug within 1/2 inch of front face of finished wall.

6. Cleanouts exterior to building in landscaped areas: Zurn Z-1449-BP, or equal, cleanout ferrule with tapered bronze plug. Where located at grade, provide 18 by 18 by 6 inch concrete pad; Trowel concrete smooth and edge; set flush with finished grade.
7. Cleanouts in drive areas: Zurn -1400-HD-KC, or equal, with heavy-duty top and ABS plastic plug.
8. Cleanouts in acid waste systems: Zurn ZN-1404, or equal, cleanout access housing, with ductile cast iron body and nickel bronze top. Extend acid waste piping within the cleanout, and terminate with threaded cap. Secure acid waste pipe inside cleanout access housing with setscrews provided.

B. Floor Drains:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:

a. J.R. Smith.
b. MIFAB.
c. Watts.
d. Zurn.

C. Floor Sinks:

1. Floor Sinks: Provide anchoring flange (seepage pan) at all floor sinks, and provide flashing clamp in locations where floor membrane is used. Provide cast iron "P" trap and trap primer connection at P-Trap.
2. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
   a. J.R. Smith.
   b. MIFAB.
   c. Watts.
   d. Zurn.

D. Hopper Drains:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:

a. Zurn.
b. J.R. Smith.

E. Area Drain:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:

    a. Brooks.
    b. J.R. Smith.
    c. Old Castle Precast.
    d. Watts.
    e. Zurn.

F. Backwater Valves:

1. Provide Zurn Model Z-1090 J. R. Smith 7012, or equal flapper type backwater valve where indicated on drawings. Install in accordance with manufacturer's recommendations.
2. Provide Christy Model B16, Brooks, or equal utility box, 12 inches by 22 inches size, for installation of backwater valve.
3. Provide Zurn Model Z-1091, J.R. Smith 7070, or equal terminal type backwater valve, and install in catch basin piping at the outlet of the catch basin.

G. Roof Drains and Overflow Drains:

1. See Architectural Drawings for drain style to be used.
2. Provide offset downspout boots where required for connection of exposed sheet metal downspouts to underground cast iron or PVC piping.
3. Provide rainwater leader nozzles on overflow piping. Nozzle body shall be bronze with threaded inlet and bronze wall flange with mounting holes. Size nozzle to match connected rainwater leader.
4. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:

    a. J.R. Smith.
    b. Mifab.
    c. Zurn.

2.11 HEAT TRACING

A. Description: Self-regulating, parallel-resistance heating cables.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Basis of Design: Raychem; Pentair Thermal Management.

    a. Pipe Freeze Protection: XL Trace.
    b. Grease Waste Pipe Flow Maintenance: XL Trace.
    c. Roof, Gutter, and Downspout De-Icing and Snow Melting: ICESTOP-GM2X.

2. Delta-Therm Corporation.
3. Thermon Americas Inc.

C. Comply with IEEE 515.1.

D. Heating Element: Pair of parallel No. 16 or No. 18 AWG, tinned or nickel-coated, stranded copper bus wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled, nonheating leads with connectors at one end, and seal the opposite end watertight. Cable shall be capable of crossing over itself once without overheating.

E. Electrical Insulating Jacket: Flame-retardant polyolefin.

F. Cable Cover for Above Ground Installation: Tinned-copper or stainless-steel braid and polyolefin outer jacket with ultraviolet inhibitor.

G. Cable Cover for Below Ground Installation: Tinned-copper or stainless-steel braid and fluoropolymer outer jacket.

H. Accessories:

1. Fiberglass tape, heat-conductive putty, cable ties, silicone end seals and splice kits, and installation clips all furnished by manufacturer, or as recommended in writing by manufacturer.

I. Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least 3 mils thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back.

1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch minimum.
2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

J. Controls:

1. Pipe-Mounted Thermostats:

a. Remote bulb unit with adjustable temperature range.
b. Snap action; open-on-rise, single-pole switch with minimum current rating adequate for connected cable.
c. Remote bulb on capillary, resistance temperature device, or thermistor for directly sensing pipe-wall temperature.
d. Corrosion-resistant, waterproof control enclosure.

2. Precipitation and Temperature Sensor for Snow Melting on Roofs and in Gutters:

a. Microprocessor-based control with manual on, automatic, and standby/reset switch.

b. Precipitation and temperature sensors shall sense the surface conditions of roof and gutters and shall be programmed to energize the cable as follows:

1) Temperature Span: 34 to 44 deg F .
2) Adjustable Delay-Off Span: 30 to 90 minutes.
3) Energize Cables: Following two -minute delay if ambient temperature is below set point and precipitation is detected.
4) De-Energize Cables: On detection of a dry surface plus time delay.

c. Corrosion-proof and waterproof enclosure suitable for outdoor mounting, for controls and precipitation and temperature sensors.
d. Minimum 30-A contactor to energize cable or close other contactors.
e. Provide relay with contacts to indicate operational status, on or off, for interface with central HVAC control-system workstation.

3. Controller for Pipe Freeze Protection and Flow Maintenance:

a. Microprocessor based.
b. Illuminated display panel and function buttons.
c. Indicator lights: Heater on, alarm, receive/transmit data.
d. Minimum 2 temperature sensor inputs.
e. With ground fault detection, alarm, and trip.
f. NEMA 4X enclosure.
g. Line-sensing, ambient-sensing, and proportional ambient-sensing control modes.
h. RS-485 communication module for interface with central HVAC control-system workstation. Optional BACnet gateway shall be available.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which plumbing piping systems are to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable to Contractor.

B. Make all arrangements for the utilities required. Pay all costs involved in obtaining the services including gas service and meter, water meter, pressure reducing valve, access boxes, street work. Connect to site utilities. Verify the location of all services. No extra cost will be allowed if services are not as shown.

C. Determine sanitary sewer and storm drain location and elevation at all points of connection before installing any piping. Notify Architect immediately if indicated grades cannot be maintained.

D. At time of final connection, and prior to opening valve to allow pressurization of water and gas piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, or gas pressure is not as indicated on Contract Documents, inform Architect

immediately. Do not allow piping systems to be pressurized without written consent of the Architect.

3.2 INSTALLATION OF WATER PIPING

A. Run all water piping generally level, free of traps or unnecessary bends, arranged to conform to the building requirements, and to suit clearance for other mechanical work such as ducts, flues, conduits, and other work. No piping shall be installed so as to cause unusual noise from the flow of water therein under normal conditions.

B. Provide manufactured water hammer arrestors, sized and installed in accordance with Plumbing and Drainage Institute Standard PDI WH201.

1. Locate water hammer arrestors at every plumbing fixture, or, where fixtures are located in groups, at every group of fixtures, and as indicated on Drawings.
2. Install water hammer arresters above accessible ceilings, or install access doors for service.

C. In freezing locations arrange water piping to drain as shown.

D. Install piping on room side of building insulation.

E. Check final location of rubber rings within couplings on PVC water piping with gauge or as recommended by manufacturer. Make connection to valves with cast iron adapters connected to water pipe with cast iron couplings. Furnish and install anchors or thrust blocks.

3.3 INSTALLATION OF SANITARY AND STORM DRAINAGE SYSTEMS

A. Sewer Piping: Run all horizontal sanitary drain piping inside of building on a uniform grade of not less than 1/4 inch per foot unless otherwise noted or later approved. Unless otherwise noted on the plans, piping shall have invert elevations as shown and slope uniformly between given elevations.

B. Storm Drain Piping: Run all horizontal storm drain piping inside of building on a uniform grade of not less than 1/4 inch per foot. Unless otherwise noted on the plans, piping shall have invert elevations as shown and slope uniformly between given elevations.

C. Install rainwater leader nozzles at exposed bottom of leaders where they spill onto grade.

D. Run all drainage piping as straight as possible and provide easy bends with long turns; make all offsets at an angle of 45 degrees or less.

E. Grade all vent piping so as to free itself quickly of any water condensation.

F. Where possible, join groups of vent risers together with one enlarged outlet through roof. Maintain minimum of 10 foot horizontal or 3 foot vertical clearance from air intakes.

G. Install drip pan under storm drain piping, sanitary drain piping, and vent piping that must be run over kitchen areas.

H. Hubless Cast Iron Joints: Comply with coupling manufacturer's installation instructions.

3.4 INSTALLATION OF GREASE WASTE PIPING SYSTEMS

A. Install to comply with all manufacturers' recommendations.

B. All buried pipe shall be bedded in and backfilled with 4 inches of sand, and installed as recommended by manufacturer.

C. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Maintain continuous pressure test on piping installed below grade, until all work has progressed to above grade.

D. Electrofusion joints: Make polypropylene drainage piping joints according to ASTM F 1290.

3.5 INSTALLATION OF GAS PIPING

A. Install gas piping in accordance with Division 22 Basic Plumbing Materials and Methods sections.

B. Use sealants on metal gas piping threads that are chemically resistant to propane gas. Use sealants sparingly, and apply to only male threads of metal joints.

C. Remove cutting and threading burrs before assembling piping.

D. Do not install defective piping or fittings. Do not use pipe with threads that are chipped, stripped, or damaged.

E. Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping or equipment connections are completed.

F. Ground gas piping electrically and continuously within project, and bond tightly to grounding connection.

G. Install drip-legs in gas piping where indicated and where required by code or regulation.

1. Install "Tee" fitting with bottom outlet plugged or capped at bottom of pipe risers.
2. Where gas supply is connected to equipment with flexible connectors, install drip-leg in piping on downstream side of flexible connector, and install shut off valve on piping on upstream side of flexible connector.

H. Install piping with 1/64 inch per foot (1/8 percent) downward slope in direction of flow.

I. Install piping parallel to other piping.

J. Paint all gas piping installed in exposed exterior locations. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods, article, Painting.

K. Provide shutoff valve downstream of meter.

L. Provide exterior shutoff valve at each building. Provide sign affixed to wall at valve location reading: “Gas Shut-Off.” Size and location of the sign shall be as required by the Authority Having Jurisdiction. Where gas piping enters a building in more than one location, exterior shutoff valves shall have a permanently attached metal tag identifying the area served by that valve, in addition to sign on wall.

M. Provide watertight Schedule 40 PVC conduit to protect gas piping installed below covered walk, covered driveways, and where noted on Drawings. Extend sleeve at least 12 inches beyond any area where it is required to be installed, and terminate with valve box extended to grade, and marked “GAS”.

N. Maintain minimum of 12 inch clearance between gas piping and steam piping above 200 degrees F.

3.6 PIPE JOINTS AND CONNECTIONS

A. General:

1. Cutting: Cut pipe and tubing square, remove rough edges or burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt and debris from inside and outside of pipe before assembly.
3. Boss or saddle type fittings or mechanically extracted tube joints will not be allowed.

B. Threaded Pipe: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply thread compound to external pipe threads: Rectorseal No. 5, Permatex No. 1, or equal.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

C. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

D. Copper Pipe and Tubing (Except pneumatic control piping): All joints shall be brazed according to ASME Section IX, Welding and Brazing Qualifications, except domestic water piping 1-1/4 inches and smaller when not buried in the ground or concrete and type DWV plumbing piping may be soldered.

1. Soldered joints: Apply water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828.

E. Cast Iron Soil Pipe:

1. No-Hub fittings shall be made with a torque wrench.
2. Hub joints shall be with Ty-Seal couplings.
3. Wrought iron, steel, or copper pipe shall have a ring or part of a coupling screwed on to form a spigot end if caulked into a joint.
4. Connect cast iron sewer piping to outside service pipe with cast iron or vitrified LOP reducers or increasers as required. Caulking of smaller pipe into the larger without a reducer or increaser will not be permitted.

F. Welded Pipe:

1. Make up with oxyacetylene or electric arc process.
2. All line welds shall be of the single "V" butt type. Welds for flanges shall be of the fillet type.
3. Where the branch is two pipe sizes smaller than the main or smaller, Bonney Weldolets, Threadolets, Nibco, or equal, may be used in lieu of welding tees.

G. Polyethylene and Polypropylene Pipe: Assemble with fusion joints in strict accordance with manufacturer's instructions.

H. Flexible Connections:

1. Furnish and install Thermo Tech., Inc. F/J/R, Metraflex, or equal, flexible couplings with limiter bolts on piping connections to all equipment mounted on anti-vibration bases, on each connection to each base mounted pump and where shown. Couplings shall be suitable for pressure and type of service.
2. Anchor piping securely on the system side of each flexible connection.

3.7 INSTALLATION OF VALVES

A. Install valves as indicated on Drawings and in the following locations:

1. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.
2. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere indicated or required to completely drain potable water system.
3. Provide gate or globe valves on inlet and outlet of each water heater or pump.

B. General:

1. Valves shall be full line size unless indicated otherwise on Drawings.
2. Install horizontal valves with valve stem above horizontal, except butterfly valves.
3. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

4. Locate valves for easy access and provide separate support where necessary.
5. Install valves in position to allow full stem movement.
6. Install exposed polished or enameled connections with special care showing no tool marks or exposed threads.
7. Butterfly valves conforming to the paragraph “Butterfly Valves” may be used in lieu of gate or globe valves for locations above grade.
8. Ball valves conforming to the paragraph “Ball Valves” may be used in lieu of gate valves for locations above grade for services 2-1/2 inches and smaller.
9. Valves 2-1/2 inches and smaller (except ball valves) in nonferrous water piping systems may be solder joint type with bronze body and trim.
10. Rigidly fasten hose bibbs, hydrants, fixture stops, compressed air outlets, and similar items to the building construction.

C. Gate Valves:

1. Furnish valves in copper lines with adapters to suit valve / line requirements.
2. Underground gate valves:

a. Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
b. Furnish and deliver to Owner one wrench of each size required for operating underground valves.

D. Swing Check Valves: Install in horizontal position with hinge pin level.

E. Butterfly Valves: Install with stems horizontal.

F. Silent Check Valves: Install in horizontal or vertical position between flanges.

G. Calibrated Balancing Valves: Install calibrated balancing valves per manufacturers’ recommendations, including requirements for straight pipe lengths at valve inlet and outlet.

H. Gas Shut-Off Valves:

1. Provide line size ball valve in gas line to each appliance.
2. Provide line size ball valve in gas line, to be used as emergency shut-off for science classrooms. Install valve in locking box where indicated on the drawings.
3. Provide line size electric solenoid gas valve in gas line to kitchen equipment (if not supplied with appliance) under Type 1 hood. Interlock with hood fire alarm system.

I. Valve Adjustment: Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.8 INSTALLATION OF CLEANOUTS

A. Cleanouts: Install in piping as indicated, as required by California Plumbing Code, at each change in direction of piping greater than 45 degrees. Install at maximum

intervals of 50 feet for piping 4 inches and smaller and 100 feet for larger piping inside buildings, and at base of each conductor.

B. Flashing Flanges: Install flashing flange and clamping device with each cleanout passing through water resistant membrane.

3.9 INSTALLATION OF FLOOR DRAINS AND FLOOR SINKS

A. Install drains in accordance with manufacturer's written instructions and in locations indicated. Install floor drains with lip of drain slightly below finished floor to ensure drainage. Install floor sinks flush with finished floor. Coordinate with other trades to ensure that floor slopes to drain. Provide flashing flange and clamping device with each drain passing through water resistant membrane.

B. Install vented P-trap below each drain. Where trap primers are indicated, install trap primer connection in the P-trap.

3.10 INSTALLATION OF ROOF DRAINS AND OVERFLOW DRAINS

A. Install roof drains and overflow roof drains in accordance with manufacturer's written instructions and in locations indicated.

B. Coordinate with roofing as necessary to interface roof drains with roofing work.

3.11 INSTALLATION OF HOPPER DRAINS

A. Install hopper drain in wall, in sheet metal box, with access door.

1. Size access door and box to suit the size required for hopper drain and trap primer, and solder all seams of box. Seal all penetrations to box with non-hardening waterproof sealant. Provide locking door in occupied spaces.

B. Grind top and sides of funnel, if required, to suit wall thickness.

3.12 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers where indicated on Drawings. Provide drain connection available from the manufacturer at drain connection, pipe drain outlet to the nearest floor drain.

1. Where drain pans are shown on the Drawings, pipe drain pan outlet to nearest floor drain.

3.13 TRAP PRIMER INSTALLATION

A. Install as indicated in manufacturers printed literature, with 1/2 inch, Type L, hard copper piping to trap primer connection on floor drains and floor sinks where indicated on Drawings. At Contractor’s option, Type K annealed copper tubing without joints may

be used be used below slab only. See Section 22 00 50 for pipe protection requirements for below slab copper piping/tubing.

B. Install trap primer piping with 1/4 inch per foot slope, to insure that the line will drain fully to the floor drain or floor sink.

1. Provide ball valve to the inlet at each trap primer location.

C. Install trap primer and distribution unit exactly as called for in manufacturers printed installation instructions. Connect to domestic water piping from the top of the water line, in order to prevent foreign material from entering directly into primer assembly.

D. Mount trap primer in wall, in sheet metal box, with Karp or equal access door. Size access door and box to suit valve operation, and solder all seams of box. Seal all penetrations to box with non-hardening waterproof sealant. Provide locking door where installed in occupied spaces.

E. Where one trap primer will be used for more than one trap, provide a distribution unit with feeder piping for a maximum of four traps sized for equal pressure drop to each trap.

3.14 INSTALLATION OF GAS PRESSURE REGULATING VALVES

A. Install as indicated; comply with utility requirements. In locations where regulators are installed in confined spaces, pipe atmospheric vent to outdoors, full size of outlet. Install gas shutoff valve upstream and downstream of each pressure-regulating valve.

3.15 GAS PIPING EQUIPMENT CONNECTIONS

A. Connect gas piping to each gas-fired equipment item, with union, drip leg and shutoff gas cock full size of supply line shown. Reduce only at connection to equipment. Comply with equipment manufacturer's instructions.

1. Route gas vent and gas relief to outside.
2. Gas shutoff valve shall be placed as close as possible to equipment in a location where it can be serviced. Distance from equipment to valve shall not exceed 6 feet.

3.16 EQUIPMENT CONNECTIONS

A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated.

B. Mechanical Equipment Connections: Connect hot and cold water piping system and gas piping system to mechanical equipment as indicated, and provide with shutoff valve and union for each connection.

3.17 INSTALLATION OF HEAT TRACING

A. Examination: Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance. Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Install electric heating cable across expansion, construction, and control joints according to manufacturer's written instructions; use cable-protection conduit and slack cable to allow movement without damage to cable.

C. Electric Heating-Cable Installation for Snow and Ice Melting on Roofs and in Gutters and Downspouts: Install on roof and in gutters and downspouts with clips furnished by manufacturer that are compatible with roof, gutters, and downspouts.

D. Electric Heating-Cable Installation for Freeze Protection for Piping:

1. Install electric heating cables after piping has been tested and before insulation is installed.
2. Install electric heating cables according to IEEE 515.1.
3. Install insulation over piping with electric cables according to Section 220050 "Basic Plumbing Materials and Methods."
4. Install warning tape on piping insulation where piping is equipped with electric heating cables.

E. Electric Heating-Cable Installation for Flow Maintenance:

1. Install electric heating cables after piping has been tested and before insulation is installed.
2. Install insulation over piping with electric heating cables according to Section 220050 "Basic Plumbing Materials and Methods."
3. Install warning tape on piping insulation where piping is equipped with electric heating cables.

F. All junction boxes shall be located above grade level. Covers shall be kept on boxes at all times when not working therein. Where allowable, a hole shall be provided in bottom of junction boxes to permit moisture to escape.

G. Junction boxes, thermostats, transformers and other system components shall not be attached to pipe insulation but shall be mounted on brackets fabricated of galvanized angle, channel or other material of sufficient strength to support components. Brackets shall be supported separately from pipes.

H. Set field-adjustable switches and circuit-breaker trip ranges.

I. Field Quality Control:

1. Perform insulation and continuity testing in accordance with cable manufacturers' recommendations at the following times:

a. Before cable installation.

b. Before connection kit installation.
c. After installing thermal insulation.

2. Perform other tests recommended by cable manufacturer.

J. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

1. Service representative shall perform final insulation resistance and continuity test, and other tests recommended by cable manufacturer.

K. Demonstration and Training: Manufacturer shall provide one on-site 2-hour training session for Owners' maintenance personnel.

L. All heat traced piping shall be insulated within 24 hours upon cable installation and acceptance. For insulation requirements, refer to Section 220050, Basic Plumbing Materials and Methods.

M. Extra cable to be provided at piping specialties and fittings such as valves and flanges to allow dismantling and removal of equipment.

3.18 KITCHEN EQUIPMENT INSTALLATION

A. Coordinate all work with Specification Section for kitchen equipment.

B. All equipment shall be fully connected.

C. Furnish and install all required "P" traps.

D. Provide stops on all hot and cold water lines at equipment, in an accessible position. Include lines to kettle and range swing faucets.

E. Water pressure for dishwasher and glass-washer to be 25 pound maximum. Provide pressure reducing valves on water line to washers.

F. All floor openings are to be sealed watertight.

G. Indirect waste lines required for standard or fabricated items of kitchen equipment, except sinks, shall be furnished and installed by the kitchen equipment contractor.

H. Provide all sink drains. All indirect drains shall terminate above floor sinks at least 1-1/2 times ID of drain line and shall be so set that flare will not spill on floor area.

I. Provide approved vacuum breaker or anti siphon device on water lines to equipment wherever required.

J. Provide gas pressure regulators for modular front manifold cooking equipment assemblies. Pressure regulators shall be adjustable from 2 inch to 7 inch water column and shall be set for approximately 6 inches W.C. at manifold connection.

K. All gas pressure regulators shipped loose with gas fired equipment shall be installed by plumbing contractor.

L. The kitchen equipment contractor will provide all equipment trim including faucets and sink wastes and swing faucets at kettles all to be installed by Plumbing contractor.

M. All horizontal piping lines connected to equipment shall be run at the highest possible elevation not less than 6 inches above floor. Piping rough-in shall be stubbed in walls wherever possible.

N. Vent piping for waste lines shall be concealed wherever possible and vertical vents for island or free-standing equipment shall be avoided. Any required exposed vents shall be submitted to the Architect for approval.

O. Kitchen equipment contractor to furnish coffee maker. Plumbing contractor shall provide a cold water connection terminating in a 3′-0″ length of 1/4 inch OD soft copper tubing with a 1/4 inch female flare fitting on the end.

P. Fire protection systems for ventilators and cooking equipment are furnished and installed by kitchen equipment contractor unless shown otherwise on the drawings. Gas valves which are a part of the fire protection systems are furnished only. Plumbing Contractor shall install gas valves.

Q. Connect movable gas-fired cooking equipment utilizing flexible gas connection system.

3.19 LABORATORY EQUIPMENT AND CASEWORK INSTALLATION

A. Coordinate all work with Specification Section for Laboratory Equipment and Casework.

B. Furnish and install all required P-traps. Traps shall be Enfield, Fuseal, or equal.

C. Provide stops on all hot and cold water lines at equipment in an accessible position.

D. Seal floor openings watertight.

E. Provide approved vacuum breaker or anti-siphon device on water lines to equipment wherever required.

F. All horizontal piping lines connected to equipment shall be run at the highest possible elevation not less than 6 inches above floor. Piping rough-in shall be stubbed in walls wherever possible.

G. Vent piping for waste lines shall be concealed and vents for island or freestanding equipment shall be looped.

3.20 DOMESTIC WATER SYSTEM STERILIZATION

A. Clean and disinfect new or altered hot and cold water piping connected to domestic water systems using methods prescribed by the Health Authority. If the Health

Authority does not prescribe methods, clean and disinfect new or altered hot and cold water piping using methods given in the California Plumbing Code.

1. A water treatment company that has a current state EPA license to apply disinfectant chlorine in potable water shall perform the procedure.

3.21 CARE AND CLEANING

A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures, and trim that are installed as part of this work. Remove labels from stainless steel sinks, except 316 stainless steel sink labels should be retained to confirm that the correct material has been provided. Leave systems and equipment in satisfactory operating condition.

3.22 OPERATIONAL TESTS

A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

3.23 TESTING AND BALANCING

A. See Section 23 05 93 of Specifications for testing and balancing requirements.

3.24 CLEANING UP

A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

END OF SECTION 22 10 00

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water supplies and stops.
2. Plumbing fixture hangers and supports.
3. Refrigerator ice maker outlet boxes.
4. Dishwasher air gap fittings.
5. Solids interceptors.
6. Washing machine hose/supply boxes.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.3 ACTION SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Product Data: Submit manufacturer's specifications for plumbing fixtures and trim, including catalog cut of each fixture type and trim item furnished.

1.4 INFORMATIONAL SUBMITTALS

A. Refer to Section 22 00 50, Basic Plumbing Materials and Methods.

1.5 CLOSEOUT SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Maintenance Data: Submit maintenance data and parts lists for each fixture type and trim item, including instructions for care of finishes. Include this data in Operation and Maintenance Manual.

1.6 QUALITY ASSURANCE

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Plumbing Fixture Standards: Comply with applicable portions of the following codes and requirements for all work in this Section:

1. California Building Code – CBC
2. California Plumbing Code – CPC
3. California Health and Safety Code
4. American National Standards Institute - ANSI
5. Federal Standards - F.S.
6. National Sanitary Foundation – NSF International

C. ANSI Standards: Comply with ANSI/NSF 61, “Drinking Water System Components – Health Effects.”

D. PDI Compliance: Comply with standards established by Plumbing and Drainage Institute pertaining to plumbing fixture supports.

E. UL Labels: Provide water coolers that have been listed and labeled by Underwriters' Laboratories.

F. ARI Labels: Provide water coolers that are rated and certified in accordance with applicable Air-Conditioning and Refrigeration Institute Standards.

G. Americans with Disabilities Act (ADA).

H. California Green Building Standards Code Requirements:

1. Tank-type water closets shall be certified to the performance criteria of the U.S. EPA WaterSense Specification for Tank-Type Toilets.
2. Single Showerheads shall be certified to the performance criteria of the U.S. EPA WaterSense Specification for Showerheads.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES

A. General: Provide factory fabricated fixtures of type, style and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by the manufacturer, and as required for a complete, installation. Where more than one type is dedicated, selection is Contractor's option; but, all fixtures of same type must be furnished by single manufacturer.

1. Take special care with the roughing-in and finished plumbing where batteries of fixtures occur.
2. Take location and mounting heights for roughing-in from Architectural Drawings.

3. Follow schedule on Plumbing Drawings for roughing-in connections. Set roughing-in for all fixtures exactly as per measurements furnished by the manufacturers of the fixtures used.
4. Roughing-in for lavatories and sinks shall be brought in through the wall under the centerline of the drain from the fixture wherever possible and as close to the fixture as possible.

2.2 MATERIALS

A. Provide materials that have been selected for their surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, foundry sand holes, stains, discoloration, or other surface imperfections on finished units are not acceptable.

B. Where fittings, trim and accessories are exposed or semi-exposed, provide, chromium plated 17 gauge seamless brass and match faucets and fittings. Provide 17 gauge seamless copper or brass where not exposed.

C. Handles on all faucets and stops shall be all metal chromium plated.

D. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.

2.3 PLUMBING FITTINGS, TRIM AND ACCESSORIES

A. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, or dispensing devices, of type and size indicated, and as required to operate as indicated.

1. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shut-down of water supply piping systems.

B. P-Traps: Include IAPMO approved removable P-traps where drains are indicated for direct connection to drainage system. P-Traps shall be less trap screw cleanout, and incorporate a chrome plated cast brass body, brass connection nuts, 17 gauge seamless brass wall return and chrome plated wall escutcheon to match trap finish.

C. Carriers: Provide cast iron supports for fixtures of graphitic gray iron, ductile iron, or malleable iron as indicated. Where the carrier for wall mounted water closets are installed more than 6 inches behind the finished wall, provide water closet support for wide pipe chase.

D. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.

E. Escutcheons: Where fixture supplies and drains penetrate walls in exposed location, provide chrome-plated cast brass escutcheons with setscrews.

F. Aerators: Provide aerators of types approved by Health Departments having jurisdiction. Delete aerators where not allowed by CPC for health care occupancies.

G. Comply with additional fixture requirements contained in Fixture Schedule shown on the drawings.

2.4 MANUFACTURERS

A. In accordance with California Plumbing Code, provide indelibly marked or embossed manufacturers name or logo, arranged so as to be visible after installation.

B. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following:

1. Stainless Steel Security Plumbing Fixtures:
   a. Willoughby Industries.
   b. Acorn Engineering.

2. Vitrified China Plumbing Fixtures:

   a. American Standard, U.S. Plumbing Products.
   b. Eljer Plumbingware Div., Wallace-Murray Corp.
   c. Kohler Co.
   d. VitrA.

3. Modular Lavatories:

   a. Bradley.
   b. Acorn.
   c. Willoughby Industries, Inc.

4. Plumbing Trim:

   a. McGuire Manufacturing Co., Inc.
   b. Delta Commercial.
   c. Chicago Faucet Co.
   d. T&S Brass and Bronze Works, Inc.

5. Flush Valves:

   a. Sloan Valve Co.
   b. Zurn Industries, Hydromechanics Div.
   c. Toto USA, Inc.

6. Faucets:

   a. Chicago Faucet Co.
   b. Symmons Scott.
   c. T&S Brass and Bronze Works, Inc.
   d. Delta Commercial.

7. Fixture Seats:

a. Church Seat Co.
b. Bemis Mfg. Co.
c. Beneke Corp.

8. Water Coolers and Drinking Fountains:

a. Haws Corporation.
b. Halsey Taylor Mfg. Co.
c. Elkay Mfg. Co.
d. Acorn Aqua.

9. Service Sinks:

a. American Standard.
b. Kohler Co.
c. Williams Serviceptor.
d. Florestone.
e. Acorn.

10. Stainless Steel Sinks:

a. Elkay Mfg. Co.
b. Just Mfg. Co.
c. Haws Corporation.

11. Showers:

a. Acorn.
b. Bradley.
c. Symmons.
d. Powers.

12. Emergency Equipment:

a. Haws Corporation.
b. Gardian.
c. Symmons.
d. Bradley.
e. Encon.

13. Fixture Carriers:

a. Josam Mfg. Co.
b. J. R. Smith.
c. Tyler Pipe; Wade Div.
d. Zurn Industries; Hydromechanics Div.
e. Mifab, Inc.

2.5 FLUSH VALVE REQUIREMENTS

A. Metering flush valves where required and specified shall be non-hold open type with exposed parts chrome plated. Conform to all codes and manufacturers' recommendations. All diaphragms are to have multiple filtered bypass and be chloramine resistant synthetic rubber with internal components suitable for l80 degree hot water to l50 pounds pressure, plastic or leather diaphragm not acceptable.

B. Electronic flush valves where required and specified shall be non-hold open type with exposed parts chrome plated. Conform to all codes and manufacturers' recommendations. All diaphragms are to have multiple filtered by pass and be chloramine and resistant synthetic rubber with rubber and internal components suitable for 180 degree hot water to 150 pounds pressure, plastic or leather diaphragm not acceptable. All flush valve solenoids and sensors shall be UL listed.

2.6 FIXTURE CONNECTIONS

A. Make connection between fixtures and flanges on soil pipe absolutely gastight and watertight with neoprene type gaskets (wall hung fixtures) or bowl wax (floor outlet fixtures). Rubber gaskets or putty will not be permitted.

B. Provide fixtures not having integral traps with P-traps of chromium-plated 17 gauge cast brass, with 17 gauge seamless brass wall return, connected to concealed waste in wall and sanitary fittings. Provide IAPMO approval for trap, and provide less trap screw cleanout.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

    a. Dearborn Brass, Commercial series with brass nuts.
    b. Delta Commercial.
    c. McGuire Manufacturing Co., Inc.

C. Connections from stacks or horizontal wastes to wall or floor finish for wastes from lavatories, urinals, sinks, and drinking fountains and connection between floor drains and traps shall be IPS 85 percent red brass pipe.

D. Plumbing fixture traps connected to special waste systems shall be constructed of materials to suit the waste system.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

    a. Orion.
    b. Enfield

E. Unions on waste pipes on fixture side of traps may be slip or flange joints with soft rubber or lead gaskets. Traps shall rough in full size to waste and vent connection, using deep escutcheon plate to cover wall penetration. Compression adaptor extensions or sweat adaptors are not acceptable.

2.7 WATER SUPPLIES AND STOPS

A. Provide 85 percent IPS threaded red brass nipple, conforming to the lead-free requirements of California Health and Safety Code Section 116875, securely anchored to building construction, for each connection to stops, hose bibbs, etc. Each fixture, except hose bibbs, shall have stop valves installed on water supply lines.

B. Provide water supplies to fixtures with compression shut-off stops with threaded inlets and lock shield-loose key handles. Provide combination fixtures with compression stop and threaded inlet on each water supply fitting. Provide lock shield-loose key handle for each stop.

C. Provide 1/2 inch riser tubes with reducing coupling for fixtures, unless otherwise noted.

D. Provide cast brass escutcheon.

E. Furnish shut-off valves on hose bibbs where directly connected to mains with no intervening valves.

F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. McGuire Manufacturing Company, Inc., model LFH2167LK.
2. T & S Brass and Bronze Works, Inc., model B-1305.

2.8 PLUMBING FIXTURE HANGERS AND SUPPORTS

A. Floor-affixed supports for off-the-floor plumbing fixtures shall comply with ASME A112.6.1M.

B. Residential type fixture supports are not acceptable.

C. Install wall mounted water closets with combination support and waste fittings, with feet of support securely anchored to floor.

D. Install floor mounted water closets with J.R. Smith, Zurn, or equal government pattern cast iron closet flanges with brass bolts, nuts, washers, and porcelain caps secured with Spackle.

E. Install the following fixtures on concealed support with feet of support securely anchored to floor. Anchor top of support to wall construction in an approved manner.

1. Wall hung lavatories.
2. Wall mounted urinals.
3. Drinking fountains.
4. Electric water coolers.

2.9 PLUMBING FIXTURES

A. Install all plumbing fixtures at height indicated on Architectural Drawings. Where mounting height is not indicated, install at height required by Code.

B. Special Requirements For Accessible Fixtures:

1. Operating handle or valve for accessible water closets, urinals, lavatories, and sinks shall operate with less than 5 pounds force. Metering faucets shall be adjusted to operate between 10 and 15 seconds.
2. Insulate exposed waste piping and domestic water supplies below accessible fixtures with CBC access code compliant molded “closed-cell” vinyl covers. Covers shall be installed using vandal resistant fasteners and must be removable. Covers shall meet flame spread rating not to exceed 25 and smoke density not to exceed 50 when tested in accordance with ASTM E-84, and shall comply with the requirements of California Code of Regulations, Title 24. Plumberex – Handy Shield, Johns Manville – Zeston 2000, or equal.

C. Refrigerator Ice Maker Outlet Boxes:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:

   Guy Gray.
   Water-Tite.

D. Dishwasher Air Gap Fittings:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:

   a. Zurn Industries, LLC.
   b. Dearborn Brass.

E. Solids Interceptors:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:

   J.R. Smith Mfg. Co.

F. Washing Machine Hose/Supply Boxes:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:

   Acorn Engineering Co.

PART 3 - EXECUTION

3.1 PRODUCT HANDLING AND PROTECTION

A. Deliver packaged materials in their original, unopened wrapping with labels intact. Protect materials from water, the elements and other damage during delivery, storage and handling.

3.2 PREPARATORY PROVISIONS

A. The Contractor is responsible for the examination and acceptance of all conditions affecting the proper construction and/or installation of the Work of this Section. Do not proceed until all unsatisfactory conditions have been corrected. Commencing work will be construed as acceptance of all conditions by the Contractor as satisfactory for the construction and/or installation of the Work.

3.3 INSPECTION AND PREPARATION

A. Examine roughing-in work of domestic water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings. Ensure that plumbing fixtures comply with requirements and serve intended purposes. Comply with applicable requirements of the National Standard Plumbing Code pertaining to installation of plumbing fixtures.

C. Fasten plumbing fixtures securely to supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies to blocking behind or within wall construction so as to be rigid, and not subject to pull or push movement.

D. Install CBC accessible fixtures in accordance with Chapter 4 California Plumbing Code, and Chapters 11A and 11B California Building Code.

E. Refer to Division 26 for wiring for electronic flush valves.

3.4 FAUCET INSTALLATION

A. Provide 85 percent IPS red brass pipe, conforming to lead-free requirements of California Health and Safety Code Section 116875, securely anchored to building construction, for each connection to faucets, stops, hose bibbs, etc. Each fixture, except hose bibbs, shall have a stop valve installed on water supply lines to permit repairs without shutting off water mains.

B. Adjust metering faucets to run for 10 to 15 seconds.

3.5 CLEAN AND PROTECT

A. Clean plumbing fixtures of dirt and debris upon completion of installation.

B. Protect installed fixtures from damage during the remainder of the construction period.

C. Grout voids between all fixtures and adjacent surfaces with white Dow Silicone Sealant, arranged to shed water.

3.6 FIELD QUALITY CONTROL

A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

3.7 EXTRA STOCK

A. General: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt. Furnish one device for every ten units.

END OF SECTION 22 40 00

SECTION 22 50 00

PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES
1. Gas fired water heaters.
2. Expansion tanks.
3. In-line domestic hot water recirculation pumps.
4. Neutralizing basin.
5. Concrete grease interceptors.
6. Inline sewage grinder pumps.
7. Oil interceptor.
8. Insulation.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.3 ACTION SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Product Data: Submit manufacturer's plumbing equipment specifications, installation and start-up instructions, capacity and ratings, with selection points clearly indicated.

1.4 INFORMATIONAL SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

1.5 CLOSEOUT SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Maintenance Data: Submit maintenance data and parts lists for each item of plumbing equipment. Include "trouble-shooting" maintenance guides. Include this data in Operation and Maintenance Manual.

1.6 QUALITY ASSURANCE

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Trade names or catalog numbers stated herein indicates grade or quality of materials desired.

C. Dimensions, sizes, and capacities shown are minimum and shall not be changed without permission of Architect.

D. UL and NEMA Compliance: Provide electric motors and electrical components required as part of plumbing equipment, which have been listed and labeled by Underwriters Laboratories and comply with NEMA standards.

E. Pump types and sizes regulated by the US Department of Energy's "Energy Conservation Standards for Pumps" 10 CRF Parts 429 and 431 shall be marked with a compliant PEI_{CL} or PEI_{VL} (Pump Energy Index, constant or variable load) value, basic model number, and RPM on the nameplate. Regulated pumps shall be listed in the Hydraulic Institute (HI) Energy Rating database (er.pumps.org) and be assigned an Energy Rating as defined in the HI 40.5 program guide.

F. CEC Compliance: Comply with California Electrical Code (Title 24, Part 3) as applicable to installation and electrical connections of ancillary electrical components of plumbing equipment.

G. ANSI Compliance: Comply with ANSI Z223.1 (NFPA 54) "National Fuel Gas Code", as applicable to installation of gas-fired water heaters.

H. CSA/UL Labels:

1. Provide gas-fired water heaters that have been listed and labeled by CSA International or Underwriters Laboratories, certifying design according to ANSI Z21.10.1-CSA 4.1 standards governing storage-type water heaters with input ratings of 75,000 BTU/hr. or less.
2. Provide gas-fired water heaters that have been listed and labeled by CSA International or Underwriters Laboratories, certifying design according to ANSI Z21.10.3-CSA 4.3 standards governing storage-type water heaters with input ratings of greater than 75,000 BTU/hr.

I. ASME Relief Valve Stamps: Provide water heaters with safety relief valves bearing ASME valve markings.

J. ASME Code Symbol Stamps: For the following equipment, comply with ASME Boiler and Pressure Vessel Code for construction, and stamp with ASME Code symbol:

1. Water Heaters 200 MBH and greater.

K. California Energy Commission Compliance: Provide written confirmation of listing of all water heaters in the "Appliance Efficiency Database."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials in their original, unopened wrapping with labels intact. Protect materials from water, the elements and other damage during delivery, storage and handling.

1.8 WARRANTY

1. Power Gas Fired Water Heaters: Three-year minimum limited warranty on tank.
2. Direct Vented Sealed Combustion Condensing Gas-Fired Water Heater: Three-year minimum limited warranty on tank.
3. Instantaneous Gas-Fired Water Heater: three-year minimum limited warranty on heat exchanger and parts.

PART 2 - PRODUCTS

2.1 MATERIALS

A. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 and NSF 372.

B. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

2.2 GAS FIRED WATER HEATERS

A. General: All units shall comply with the emissions requirements of the Air Quality Management District (AQMD) in which they are to be installed.

B. Power Gas Fired Water Heaters:

1. General: Provide commercial power gas-fired water heater of size, capacity, and electrical characteristics as noted on Drawings. Comply with ASHRAE 90.1 for energy efficiency. Provide UL or CSA International listing. Units with gas input above 200 MBH shall be ASME constructed and listed, stamped for 125 PSIG.
2. Heater: Working pressure of 150 psi, magnesium anode rod, glass lining on internal surfaces exposed to water.
3. Jacket: Insulate tank with vermin-proof glass fiber or polyurethane foam insulation. Provide heavy-gauge steel jacket and baked enamel finish.

4. Accessories: Provide brass drain valve and 3/4 inch temperature and pressure relief valve. Provide thermometer, installed in the top 1/3 of the tank or at hot water discharge at the tank.
5. Provide equal flow manifold for piping entering and leaving the water heaters. Manifold shall be provided as a standard option for the heaters proposed.
6. Controls: Adjustable immersion thermostat with safety shutoff.
7. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

    a. Bradford White Corporation.
    b. Lochinvar Corporation.
    c. PVI Industries, LLC.
    d. Rheem Manufacturing Company.
    e. Smith, A.O. Water Products Co.; a division of A.O. Smith Corporation.

8. Vent: Furnish and install "Metalbestos", Selkirk, or equal, Model PS, all-steel vent, UL listed. Furnish complete with roof support, flashing, Briedert, Metalbestos, or equal, Type L stainless stack cap, .035" stainless steel inner pipe, and all supports and accessories required for a complete installation. All joints shall be sealed with silicone sealant as recommended by the manufacturer for pressure-tight joints.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

        1) American Metal Products
        2) Selkirk
        3) Metalbestos

C. Direct Vented Sealed Combustion Condensing Gas-Fired Water Heater:

1. General: Provide commercial direct vented sealed combustion condensing gas-fired water heater of size, capacity, and electrical characteristics as noted on Drawings. Provide UL or CSA International listing. Design unit to conform to the following:

    a. ASHRAE/IESNA 90.1.
    b. California NOx emission requirements.
    c. Units with gas input above 200 MBH shall be ASME constructed and listed, stamped for 150 PSIG.
    d. Minimum efficiency of 95 percent.

2. Storage Tank Construction: Seamless steel with 150 psig working-pressure rating, glass lining on internal surfaces exposed to water.
3. Factory-Installed Storage Tank Appurtenances:

    a. Anode Rods: Magnesium.
    b. Jacket: Heavy-gauge steel with enameled finish.
    c. Cleanout: Hand-hole cleanout though tank and jacket.
    d. Burner: Low NOx, pre-mix powered type, down-fired configuration.

e. Insulation: Non-CFC foam.
f. Drain Valve: Brass construction.
g. Heat Exchanger Coil: Located within submerged combustion chamber.
h. Combination Temperature and Pressure Relief Valve.
i. Dielectric Fittings.

4. Accessories: Provide thermometer, installed in the top 1/3 of the tank or at hot water discharge at the tank.
5. Controls: Adjustable electronic immersion thermostat with safety shutoff.
6. Condensate Drain Piping: CPVC piping as defined in Section 22 10 00.
7. Vent and Exhaust Piping: CPVC piping as defined in Section 22 10 00
8. See equipment Schedule and details on Drawings for additional accessories and requirements.
9. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. Bradford White Corporation.
b. Lochinvar Corporation.
c. PVI Industries, LLC.
d. Rheem Manufacturing Company.
e. Smith, A.O. Water Products Co.; a division of A.O. Smith Corporation.

D. Instantaneous Gas-Fired Water Heater:

1. General: Provide instantaneous gas-fired water heater of size, capacity, and electrical characteristics as noted on Drawings. Unit shall be suitable for interior or exterior installation and multiple-unit battery configuration as shown on Drawings, and shall be design certified and listed by CSA International. Design unit to conform to the following:

a. ASHRAE/IESNA 90.1.
b. California NOx emission requirements.
c. Minimum efficiency of 82 percent.
d. 150 PSI maximum water pressure.

2. Factory-Installed Appurtenances:

a. Jacket: Heavy-gauge steel with enameled finish.
b. Burner: Low NOx, horizontal stainless steel, direct electronic ignition.
c. Gas Valve: Automatic modulating type.
d. Gas Pressure Regulator.
e. Heat Exchanger Coil: Copper, integral fin and tube type.

3. Accessories: Provide with the following:

a. Thermometer, as described in Section 22 00 50.
b. Wall mounting bracket.
c. ASME pressure relief valve.

4. Controls and Safeties: Shall provide the following features:

a. Flame proof sensor.
b. High temperature shut-off.
c. Over-current protection.
d. Freeze protection.

5. Vent and Exhaust Piping: Provide field-fabricated or factory furnished piping as required by unit manufacturer for exterior or interior installations. Piping material shall be per unit manufacturers' requirements. Provide factory furnished vent termination cap for exterior installations.
6. See equipment Schedule and details on Drawings for additional accessories and requirements.
7. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. Bradford White Corporation.
b. Rinnai Corporation.
c. Takagi Industrial Corporation.

2.3 EXPANSION TANKS

A. Provide thermal expansion tanks of size and number as indicated on Drawings, conforming to lead-free requirements of California Health and Safety Code Section 116875. Construct tank of welded steel for working pressure of 125 psi. Provide specially compounded flexible diaphragm securely sealed into tank to permanently separate air charge from system water, to maintain design expansion capacity.

1. Tanks shall be IAPMO approved and listed for use with domestic water systems.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Amtrol, Inc.
2. A.O. Smith Water Products Company.
3. Watts Water Technologies, Inc.

2.4 IN-LINE DOMESTIC HOT WATER RECIRCULATION PUMPS

A. Provide lead-free in-line domestic water recirculation pumps where indicated on Drawings and of capacities as scheduled on Drawings. Pumps shall be third-party certified by an approved laboratory as complying with California Health and Safety Code Section 116875.

B. Pumps shall be of the centrifugal type with non-overloading characteristics and shall not overload the motor above its nameplate horsepower rating under any operating condition. No allowance for service factor shall be used in pump selection. Motor horsepower shown is minimum; furnish larger motors if necessary to meet the non-overloading requirements.

C. Type: Horizontal, designed for 125 thru 150 psi maximum working pressure and 225 degrees F continuous water temperature.

D. Construction: Bronze casing, non-metallic impeller.

E. Shaft: Ceramic, supported by carbon bearings. Bearings shall be lubricated by the pumped water.

F. Motors shall have permanently lubricated ball bearings. Motors shall meet NEMA specifications. Motors shall have built-in thermal overload or impedance protection.

G. Provide control wiring between field-installed controls, indicating devices, and pump control panels as work of this section, complying with requirements of Division 26 sections:

1. Control wiring specified as work of Division 23 for Automatic Temperature Controls is work of that section.

H. Wire pumps to mechanical control circuits to shut down pump when building is not occupied. Where no control system is installed, furnish pump manufacturers standard timer to automatically turn off circulating pump when hot water is not required.

I. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Grundfos Pumps Corporation.
2. Bell & Gossett, ITT Corporation.
3. Taco Incorporated.
4. Armstrong Pumps, Inc.

2.5 NEUTRALIZING TANKS

A. Plastic-Tank Neutralization Systems

1. Description: System for neutralizing chemical waste.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. Orion Fittings; a Watts Water Technologies company.
b. Town & Country Plastics, Inc.

3. Controls: Factory wired and tested, 120 V ac, to operate probes, and to monitor pH of effluent; with wiring and electrical-power cord and plug.
4. Panel: NEMA 250, Type 4X enclosure unless otherwise indicated; with manufacturer's standard features, control devices, and indicators, but not less than the following:

a. Power light and on/off switch.
b. pH analyzer with programmable meter and high- and low-pH indicators, factory calibrated.
c. Analyser and sensor fault detection.
d. NEMA 5-15R audible and visual alarm with reset switch, with 4-20 mA output for remote indication.
e. Provide with contacts for connection to building energy management system.

5. Piping between Tanks: Polypropylene. Refer to Section 221000, Plumbing Piping Systems.
6. Neutralization Tank: Polyethylene; with removable, gastight cover, heat-fused threaded sidewall inlet, outlet, and vent piping connections

   a. Limestone: Chips or lumps, with more than 90 percent calcium carbonate content and 1- to 3-inch diameter.

7. Sampling Tank: Polyethylene; with removable, gastight cover, heat-fused threaded sidewall inlet, outlet, and vent piping connections, and opening in top for probe.

   a. pH probe: Type and length suitable for sampling-tank size.

2.6 CONCRETE GREASE INTERCEPTORS

A. Furnish and install a concrete grease interceptor with minimum capacity as indicated on the drawings, complete as cataloged. Provide manholes to grade for access to each section. Provide gastight cast-iron ring and cover at grade for each manhole.

B. Provide concrete with an approved coating inside and outside.

C. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. M.C. Nottingham Company.
2. Jensen Precast.

2.7 INLINE SEWAGE GRINDER PUMPS

A. General

1. Grinder shall be of two-shafted design consisting of individual cutters and spacers driven by hexagonal shafts. The cutters shall actively grab and pull material into the stack for shredding.
2. Grinder shall have a main body housing with integral pipe flanges and integral lower end housing, upper end housing, top cover and bottom cover. Grinder shall have a motor and speed reducer to drive the cutter shafts. The equipment shall operate at low speed with a maximum cutter shaft speed of 60 rpm.

B. Performance Summary

1. Design

a.	Number of grinders	1
b.	Number of motor controllers	1
c.	Environment rating for grinders	Hazardous
d.	Environment rating for motor controllers	Non-hazardous
e.	Supply power characteristics	460 Volt / 3 phase / 60 Hertz

2. Equipment

a.	Housing flange size pattern	4” ANSI Class 150 bolt
b.	Minimum liquid handling capacity per grinder	274 GPM (17.3 l/s)
c.	Maximum pressure drop across cutter stack	0.03 psi (0.21 kPa)
d.	Nominal stack height	7” (178 mm)
e.	Maximum cutter shaft rotational speed	60 rpm
f.	Cutter type	11-tooth
g.	Spacer type	Smooth
h.	Shaft seal type	Mechanical, Tungsten Carbide
i.	Seal maximum pressure	90 psi (620 kPa)
j.	Speed Reducer Type and Ratio	Cycloidal, 29:1
k.	Installed horsepower	3 hp (2.2 kW)
l.	Motor type	TEFC
m.	Motor service factor	1.00 minimum
n.	Minimum motor efficiency (at full load)	83.9% minimum
o.	Minimum motor power factor (at full load)	77.4% minimum
p.	Minimum peak shaft torque	3,277 lb-in/hp
q.	Minimum peak force at cutter tip	1,392 lbf /hp

C. Components

1. Cutters and Spacers
   a. Cutting stack shall be of 7” height.
   b. Cutters shall have 11 teeth and be 0.310”(7.87 mm) thick
   c. Spacers shall be 0.319” (8.1 mm) thick
   d. Cutters and spacers shall be individual disks constructed of heat treated alloy steel.
   e. Cutter tooth height shall be not greater than ½-inch (13 mm) above the root diameter of the cutter.
   f. Cutter outside diameter shall not exceed a maximum 4.71” (120 mm) diameter.
   g. Cutter thickness tolerance shall be +.000/-.001” (+.000/-.025 mm). Spacer thickness tolerance shall be +.001/-.000” (+.025/-.000 mm).

h. Cutters and spacers shall be heat treated to 45-53 HRc.

i. Spacers shall have a smooth outside diameter with no tooth profiles.

j. Cutter to cutter clearance shall be a maximum of 0.011" (0.28 mm).

2. Shafts

a. Shafts shall be hexagonal, 2" (50.8 mm) across flats.

b. Shafts shall be of heat treated 4140 alloy steel with a minimum tensile strength of 149,000 psi (1,027 kPa).

c. Shaft hardness shall be 38-48 Rockwell C.

d. Drive and driven shafts shall be identical and interchangeable.

3. Shaft Bearings and Seals

a. Radial and axial loads shall be borne by sealed, oversized, deep-groove ball bearings.

b. Shaft seal type shall be mechanical.

c. Each bearing and seal arrangement shall be incorporated into a cartridge-style housing.

d. Cutter shafts shall be supported on both ends. Cantilever-style arrangements shall not be permitted.

e. Dynamic and rotating seal faces shall be Tungsten Carbide, 6% Nickel.

f. Seal cartridges shall be rated to a maximum pressure of 90 psi (620 kPa).

g. O-rings shall be of BUNA-N.

h. Seal cartridges shall not require flushing.

i. Seals shall be rated to operate wet or dry.

4. Housings and Covers

a. Housings and covers shall be of A536-84 ductile iron.

b. Main body housing shall have integral inlet and outlet flanges with bolt pattern as listed in Performance Requirements.

c. Main body housing shall have integral lower end housing for mounting of seal cartridges.

d. Main body housing shall have a minimum of two (2) inspection ports threaded 1-1/2" NPT and six (6) wash/drain ports threaded ½" NPT, including threaded sealing plugs.

e. End housings shall have integral bushing deflectors to guide solids away from seal cartridges.

f. Housings shall not contain grit or debris traps requiring periodic cleaning.

5. Transfer Gears

a. Transfer gears shall be of involute profile and fabricated from heat treated alloy steel.

b. Transfer gear tooth design, thickness and hardness shall be suitable to transfer torque between shafts up to the rated breakdown torque of the motor.

c. Transfer gears shall be factory lubricated with grease to minimize wear.

6. Low Speed Coupling
   a. Low speed coupling shall be a 3-jaw type and of heat treated alloy steel.
   b. The interface between low speed coupling halves shall be factory lubricated with grease to minimize wear.
7. Gear Motor
   a. Gear motor shall be manufactured by Sumitomo Machinery Corporation of America.
   b. Gear motor reducer shall be a cycloidal gearmotor.
   c. Gear motor speed reduction ratio shall be 29:1.
   d. Speed reducer portion of gear motor shall be grease lubricated.
   e. Motor shall be as listed in Performance Requirements.
8. Lifting Brackets
   a. Grinder shall be fitted with two (2) fabricated lifting brackets.
   b. Lifting brackets shall be designed to pick the grinder above the center of gravity and ensure grinder remains suitably vertical in movement. Lifting brackets must be suitable to bear the side loads associated with laying the grinder down in any direction.

D. MOTOR CONTROLLER
1. Description
   a. Controller shall provide programmable operation of the grinder system. Controller shall have switches, indicator lights, and other control devices.
   b. Controller shall be designed to suit the supply power and motor characteristics listed in Performance Requirements.
2. Components
   a. Enclosure
      1) Starter shall be IEC, full voltage, reversing.
      2) Contactors shall have 120-volt operating coils.
      3) Overload relays shall be adjustable and sized to full load amperes (FLA) of the motor.
   b. Control Power Transformer
      1) Control power transformer shall produce 120-volt AC power from the supply power. Transformer shall be sized and fused in accordance with code to accommodate the control power requirements.
   c. Programmable Logic Controller
      1) PLC shall be a Panasonic FPX.
   d. Current Transducer
      1) Current transducer shall be a discrete output type.

2) Current transducer shall have adjustable set point from 1-135A with 200 ms or faster response time.

3. Operation

a. Grinder control shall be in accordance with the setting of the On-Off/Reset-Remote selector switch.

1) In the OFF/RESET position the grinder shall not run. Motor controller faults shall be cleared.

2) In the ON position, the grinder shall run forward.

3) In the REMOTE position, the grinder shall operate as controlled by a remote start/stop dry contact.

b. When an obstruction jams the grinder, the controller shall stop the grinder and reverse the rotation to clear the obstruction. If the obstruction is cleared, the controller shall return the grinder to normal operation. If three (3) reverses occur within a 30 second interval, the controller shall stop the grinder motor and activate the grinder FAIL indicator and relay.

c. When a motor overload or motor over-temperature condition occurs, the motor shall be de-energized, the MOTOR FAULT indicator lamp shall be illuminated and the FAIL relay shall be energized.

d. When a power failure occurs while the system is operating, the system shall return to normal operation when power is restored.

e. When a power failure occurs while the grinder is in a fail condition, the system shall return to a fail state when power is restored. The fail state shall not be cleared until reset.

f. Reset of the grinder shall be accomplished from the controller only.

E. FINISHES

1. Paint Coatings (Ferrous Materials)

a. Ferrous metal surfaces shall be prepared to SSPC-SP6 (Commercial Blast Cleaning) and coated with minimum 6-8 mils TDFT (total dry film thickness) of aliphatic acrylic polyurethane paint, color hunter green.

2. Paint Coatings (Previously-Coated Components)

a. Previously-coated components (motors, speed reducers, etc.) shall be prepared to SSPC-SP1 (Solvent Cleaning) and SSPC-SP2 (Hand Tool Cleaning) and coated with minimum 6-8 mils TDFT (total dry film thickness) paint of aliphatic acrylic polyurethane paint, color hunter green.

F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. JWC Environmental, LLC.

2. Or approved equal.

2.8 OIL INTERCEPTOR – COMPRESSOR LOCATIONS

A. Furnish and install Oil/Sediment interceptor with minimum capacity of 12 pounds of sludge, complete as cataloged. Interceptor shall be coated fabricated steel with acid-resistant coating on interior and exterior. Provide fabricated extension, anchor flange, and single grate.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. J.R. Smith 8925-F-ARC.
2. Zurn Model Z-1189.

2.9 INSULATION MATERIALS

A. General:

1. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).
2. Products shall not contain asbestos, lead, mercury, or mercury compounds.
3. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
4. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
5. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
6. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.

B. Insulation Materials:

1. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1) CertainTeed Corporation.
2) Johns Manville.
3) Knauf Insulation.
4) Owens Corning.

C. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. Design Polymerics.

b. Foster Brand; H. B. Fuller Construction Products.
c. Knauf Insulation.

2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
3. Service Temperature Range: 0 to plus 180 deg F.
4. Color: White.

D. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. Design Polymerics.
b. Childers Brand; H. B. Fuller Construction Products.
c. Foster Brand; H. B. Fuller Construction Products.
d. Knauf Insulation.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: 0 to plus 180 deg F.
4. Color: White.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The Contractor shall be responsible for the examination and acceptance of all conditions affecting the proper construction and/or installation of the Work of this Section and shall not proceed until all unsatisfactory conditions have been corrected. Commencing work shall be construed as acceptance of all conditions by the Contractor as satisfactory for the construction and/or installation of the Work.

3.2 GAS-FIRED WATER HEATER INSTALLATION

A. Install gas-fired water heaters as indicated, in accordance with manufacturer's installation instructions and in compliance with applicable codes.

B. Furnish wiring diagram to Electrical Installer. Refer to Division 26 for wiring of units, not work of this section.

C. Connect to hot and cold water lines with shutoff valves and dielectric unions. Install ASME standard pressure and temperature relief valve. Connect drain and relief piping as noted on Drawings.

D. Start-up, test, and adjust water heaters in accordance with manufacturer's start-up instructions. Check and calibrate controls.

E. Install thermometer, in the top 1/3 of the tank or at hot water discharge at the tank.

F. Confirm that water heater proposed is suitably equipped to be brought into the building through building openings provided, and that heater may be installed and removed through building openings provided.

G. Additional requirements for direct vented sealed combustion condensing water heaters:

1. Install vent and exhaust piping for direct vented sealed combustion condensing gas-fired water heaters strictly in accordance with unit manufacturers' recommendations.
2. Trap condensate drain line per manufacturers' recommendations and run to nearest code-compliant point of disposal.

H. Additional requirements for gas fired instantaneous water heaters:

1. Install pressure relief valve at the hot water discharge of the unit.
2. Install vent and exhaust piping for instantaneous gas-fired water heaters strictly in accordance with unit manufacturers' recommendations.

3.3 PUMP INSTALLATION

A. Install pumps where indicated, in accordance with manufacturer's published instructions, complying with recognized industry practices to ensure that pumps comply with requirements and serve intended purposes.

B. Provide floor-mounted pumps with a 6 inch high concrete base and anchor bolts as recommended by the pump manufacturer. Pumps shall be carefully shimmed level.

C. Provide access space around pumps for service as indicated, but in no case less than that recommended by manufacturer.

D. Install in-line pumps with support from overhead structure on each side of pump, or as indicated on Drawings.

E. Support piping from the building structure so as to prevent any strain on the pump casings. Provide a final check for perfect alignment of the piping connections after pump has been secured to its base. Provide valves, accessories, gauges, flexible connections, and supports as indicated.

F. Install electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

G. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Do not proceed with equipment start-up until wiring installation is complete and correct.

H. Check alignment, and where necessary, realign shafts of motors and pumps within recommended tolerances by manufacturer.

I. Lubricate pumps before start-up. Start-up in accordance with manufacturer's instructions.

J. Increase piping immediately at pump suction and discharge; flexible couplings and all valves shall be full line size.

K. Trim pump impeller to obtain the desired water flow after installation, without cost to Owner.

L. Pumps shall not be connected to piping before piping is thoroughly flushed and cleaned of all dirt and grit. After piping connections have been made, systems shall be filled before starting pumps. Pumps shall not be run dry under any circumstances.

3.4 NEUTRALIZATION SYSTEM INSTALLATION

A. Install neutralization systems as detailed on Drawings. Include full initial charge of limestone.

3.5 INTERCEPTOR INSTALLATION

A. Install interceptors as indicated, in accordance with manufacturer's installation instructions and in compliance with applicable codes.

B. Support: Anchor interceptors securely to substrate. Locate interceptors so that adequate clearance is provided to remove covers and sediment baskets. Set recessed units so top of cover is flush with finished grade.

C. Piping: Connect inlet and outlet piping to interceptors.

D. Refer to local standards for special installation requirements.

3.6 INSULATION INSTALLATION

1. Insulation Installation on Pumps:

    a. Fabricate metal boxes lined with insulation. Fit boxes around pumps and coincide box joints with splits in pump casings. Fabricate joints with outward bolted flanges. Bolt flanges on 6-inch centers, starting at corners. Install 3/8-inch- diameter fasteners with wing nuts. Alternatively, secure the box sections together using a latching mechanism. Do not enclose or insulate pump motor.
    b. Fabricate boxes from G90 galvanized steel, at least 0.050 inch thick.

c. For below ambient services, install a vapor barrier at seams, joints, and penetrations. Seal between flanges with replaceable gasket material to form a vapor barrier.

3.7 DEMONSTRATION AND TRAINING

A. Provide a minimum of 8 hours of training and orientation of Owners staff in proper care and operation of Plumbing Equipment.

3.8 CARE AND CLEANING

A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures, and trim that are installed as part of this work. Leave systems and equipment in satisfactory operating condition.

3.9 OPERATIONAL TESTS

A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

3.10 CLEANING UP

A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

3.11 EQUIPMENT INSULATION SCHEDULE

A. Domestic hot water recirculation pump insulation shall be the following:

1. Mineral-Fiber Board: Thickness equal to insulation thickness for connected pipes and 3-lb/cu. ft. nominal density.

END OF SECTION 22 50 00

SECTION 22 70 00

SECURITY ELECTRONIC WATER MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electronic water management system (non-communicating) for controlling stand-alone and combination water closet/lavatory and shower security plumbing fixtures.

B. Description:

1. An advanced electronic controller uses a fully programmable microprocessor controller to operate and control solenoid activated flushometer solenoid valves, lavatory solenoid valves and shower solenoid valves.
2. When the waterproof sensor is activated it signals the controller, which activates the solenoid resulting in solenoid valve activation allowing water to flow for the pre-programmed run-time of the microprocessor.
3. The activation delays, run times and lock out parameters are preprogrammed by the factory to Napa County requirements.

C. Related Sections:

1. Section 22 40 00 - Plumbing Fixtures.

1.2 SUBMITTALS

A. Submit in accordance with Division 01.

B. Product Data for each valve, controller, module, wiring diagrams, systems architecture, appurtenances, accessories, construction details, dimensions of components.

C. Field Test Reports.

1.3 COORDINATION

A. Contractor must coordinate all termination points within each mechanical utility chase and chases as required and shown on the Drawings.

B. Coordinate interface point with security and electronic graphic controls.

1.4 FIELD QUALITY CONTROL

A. Manufacturer’s Field Service:

1. Representatives of the Water Management System must make inspections prior to start of installation, during installation, and upon completion of installation to

ascertain that the entire system(s) has been installed according to manufacturer's specifications and approved details.

2. A minimum 8 hours at start-up and 40 hours of "NO CHARGE" technical support is required.

1.5 EXTRA STOCK MATERIALS

A. Furnish extra stock materials to the Owner described below that match products installed and that are packaged with protective covering for storage and identified with labels describing content.

1. Transformer: Equal to 10 percent of amount installed.
2. Controller: Equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Programmable Water Management System: Acceptable Manufacturers, as listed below and meeting the criteria and requirements specified herein, will be acceptable:

1. Willoughby; WMS-II
2. Acorn; Master-Trol.
3. I-Con; Nexus.
4. Sloan; PWT.
5. For manufacturers/products not listed, products must meet all requirements herein and comply with substitution requirements in Division 01.
6. Pneumatic-to-electronic or hydraulic-to-electronic systems are not allowed.

2.2 ELECTRONIC WATER MANAGEMENT SYSTEM (NON-COMMUNICATING)

A. Basis of Design Option: **Willoughby WMS-II System**

B. Provide an electronic control system that is microprocessor based.

1. The system must operate an electronic flushometer valve with dual filtered by-pass for the water closet, non-metered hot and cold water control for the lavatory, and a tempered shower control system.
2. Hot and cold-water lavatory control and shower control system must operate with one-way electronic solenoid valves.
3. System must operate on 24 VAC with low wattage power consumption.
4. All sensor assemblies must be completely waterproof.
5. Electrical hookup of the sensor and solenoid valves must incorporate quick release six pin four conductor RJ11 plug type connectors.
6. The microprocessor control board must have the ability to control flushing and water run times for water closet, lavatory fixtures and showers.

7. The control board software must incorporate electronic delays to control simultaneous flushing without queuing (delay must be prior to valve activation, as well as before reuse) and lockout timing qualities for water conservation and time-out functions to discourage misuse.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine equipment locations for compliance with requirements for installation and other conditions affecting performance.

B. Examine wiring roughing-in to verify completeness before equipment installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Wiring for Non-Communicating System:

1. The Manufacturer must provide quick release 6 pin 4 connector RJ11 type plug connectors on all wiring connecting the push-button sensors, solenoids and flushometer valve to the microprocessor control boards. Plumbing contractor is responsible for the supply and installation of any additional wiring of connectors between microprocessor control boards, push button sensors should they be required.
2. The Plumbing Contractor must secure modular wiring to walls of pipe chase and plug the modular plugs into the programmable controllers.
3. Transformers to be supplied by Plumbing Contractor.
4. The Electrical Contractor is responsible for supplying 120 volt power to each plumbing chase, and mounting and connecting all transformers.
5. The Plumbing Contractor must provide and install all low voltage wiring.
6. The Electrical Contractor is responsible for all 120 volt electrical connections.
7. The Manufacturer must provide preprogrammed microprocessor controllers. Controllers to be preprogrammed to County specifications. Program to be provided to County upon submittal approval and prior to product shipments.

3.3 MICROPROCESSOR CONTROL BOARDS (NON-COMMUNICATING)

A. The Microprocessor control boards must be installed with the following program features: All program features to act without the use of a central computer.

B. Lavatory:

1. Upon activation of hot water push-button, the water will run for twenty (20) seconds and then turn off.
2. Upon activation of the cold water push-button, the water will run for ten (10) seconds and then turn off.
3. Immediate repeat operation is possible.

C. Toilet:

1. After button is pushed, there will be a random delay of one to sixty seconds before onset of flush cycle.
2. If the fixture is flushed twice within a five (5) minute period, the system will automatically lock-out and the toilet will not flush again for one (1) hour.
3. After this lockout, the toilet will resume normal operation.
4. Activation delays and lock-outs can be programmed to customer specifications.

D. Shower:

1. Upon activation of the push-button, the water will run for three (3) minutes.
2. Repeat operation is possible after a delay of five (5) seconds.
3. If the button is held in for more than 5 seconds the water will turn off.

3.4 ADJUSTING

A. Adjust to meet initial set-up as confirmed with County Representative.

3.5 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing unit and after electrical circuitry has been energized, test for compliance with requirements.

B. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

3.6 FIELD TRAINING FOR MAINTENANCE STAFF

A. Train County's maintenance personnel in procedures required adjust, operate, and maintain units.

1. Upon completion of installation, a manufacturer's field representative must provide troubleshooting and maintenance classes for the site plumbing staff.
2. Provide staff with O&M's of installed products.
3. Review data in maintenance manuals. Refer to Division 01.
4. Schedule training with County, with at least seven days' advance notice.
5. Comply with the requirements of Article 1.4 Field Quality Control.

END OF SECTION

SECTION 23 00 50

BASIC HVAC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electric motors.
2. Motor starters.
3. Strainers.
4. Gauges.
5. Thermometers.
6. Access Doors.
7. Flexible joints.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. This Section is a part of each Division 23 Section.

1.3 ADDITIONAL REQUIREMENTS

A. Furnish and install incidental work not shown or specified necessary to provide a complete and workable system.

B. Make all temporary connections required to maintain services, including adequate heat and cooling, during the course of the Contract without additional cost to Owner. Notify Owner seven days in advance before disrupting services.

C. Provide for adjustments or modifications to fan and motor sheaves, belts, damper linkages, and other components as required to achieve specified air balance at no additional cost to Owner.

1.4 REFERENCES AND STANDARDS

A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.

1. AABC - Associated Air Balance Council
2. AFBMA - Anti Friction Bearing Manufacturer's Association
3. AMCA - Air Moving and Control Association Inc.

a. Standard 210 - Laboratory Methods of Testing Fans

4. ANSI - American National Standards Institute

5. ARI - Air-Conditioning and Refrigeration Institute
6. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
7. ASME - American Society of Mechanical Engineers
8. ASTM - American Society for Testing and Materials
9. CCR - California Code of Regulations

    a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36

10. CSA – Canadian Standards Association International
11. CSFM - California State Fire Marshal
12. NCPWB - National Certified Pipe Welding Bureau
13. NIST - National Institute of Standards and Technology
14. NEMA - National Electrical Manufacturers' Association
15. NFPA - National Fire Protection Association
16. OSHA - Occupational Safety and Health Act
17. SMACNA - Duct Manuals
18. UL - Underwriters' Laboratories, Inc.

B. Requirements of Regulatory Agencies:

1. The publications listed below form part of this specification; comply with provisions of these publications except as otherwise shown or specified.
    a. California Building Code, 2022.
    b. California Electrical Code, 2022.
    c. California Energy Code, 2022.
    d. California Fire Code, 2022.
    e. California Green Building Standards Code, 2022.
    f. California Mechanical Code, 2022.
    g. California Plumbing Code, 2022.
    h. California Code of Regulations, Title 24.
    i. California Health and Safety Code.
    j. CAL-OSHA.
    k. California State Fire Marshal, Title 19 CCR.
    l. National Fire Protection Association.
    m. Occupational Safety and Health Administration.
    n. Other applicable state laws.

2. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or specifications to repeat requirements of codes except where necessary for clarity.

1.5 DRAWINGS

A. Examine Drawings prior to bidding of work and report discrepancies in writing to Architect.

B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The HVAC Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.

1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over HVAC Drawings.
2. Because of the small scale of HVAC Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in the locations shown. Obtain the Architects approval prior to relocation of equipment and materials.
3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contactors' expense upon Architects' direction.
4. Minor changes in locations of equipment, piping, ducts, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.

C. Execute work mentioned in the Specifications and not shown on the Drawings, or vice versa, the same as if specifically mentioned or shown in both.

1.6 FEES AND PERMITS

A. Obtain and pay for permits and service required in installation of the Work. Arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.

B. Arrange for utility connections and pay charges incurred, including excess service charges.

C. Coordination:

1. General:

a. Coordinate HVAC Work with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.

2. Have fire damper and fire smoke damper installation instructions available at Project site during construction for use by Project Inspector.
3. Electrical Coordination:

a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:

1) Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
2) If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.
3) Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.

4. Mechanical Coordination:

a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during construction.
c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section “Access Doors and Frames.”
d. Coordinate with other trades equipment locations, pipe, duct and conduit runs, electrical outlets and fixtures, air inlets and outlets, and structural and architectural features. Provide information on location of piping and seismic bracing to other trades as required for a completely coordinated project.

1.7 SUBMITTALS - GENERAL

A. Refer to Division 01 Submittals Section(s) for additional requirements.

B. Submittal packages may be submitted via email as PDF electronic files, or as printed packages. PDFs shall be legible at actual size (100 percent). Provide seven copies of printed submittal packages.

C. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.

1. Partial or incomplete submittals will not be considered.
2. Quantities are Contractor's responsibility and will not be reviewed.
3. Provide materials of the same brand or manufacturer for each class of equipment or material.

4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.
6. Organize submittals in same sequence as in Specification Sections.
7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.

    a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
    b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
    c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
    d. Catalog cuts and published material may be included with supplemental scaled drawings.

D. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.

E. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect shop drawings or submittals on all items of equipment and materials provided. Provide submittal as a complete package.

1. Shop drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.

F. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.

1.8 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing systems materials and products.

B. Shop Drawings.

C. Sustainable Design Submittals:

1. Product Data: For adhesives and sealants, documentation of compliance including printed statement of VOC content and chemical components.
2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

D. Delegated-Design Submittals: For seismic supports, anchorages, restraints, and vibration isolators indicated to comply with performance requirements and design criteria.

1. Calculations performed for use in selection of seismic supports, anchorages, restraints, and vibration isolators shall utilize criteria indicated in Structural Contract Documents.
2. Include design calculations and details for selecting vibration isolators and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the California registered structural engineer responsible for their preparation.
3. Supports, anchorage and restraints for piping, ductwork, and equipment shall be an OSHPD pre-approved system such as TOLCO, ISAT, Mason, or equal. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.

    a. Bracing of Piping, Ductwork, and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping and ductwork, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation.
    b. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, ductwork, and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with California Building Code
4. Additional Requirements: In addition to the above, conform to all state and local requirements.

1.9 INFORMATIONAL SUBMITTALS

A. Provide coordinated layouts for HVAC Ductwork systems, in accordance with Specification Section 23 80 00.

B. Provide evidence of equipment certification to California Energy Code Section 110.1 or 110.2, if not providing Electrically Commutated motors for HVAC fans sized below 1 hp and above 1/12 hp. Refer to specific equipment articles requiring electrically commutated motors.

C. Check, Test, and Start forms, from equipment manufacturers.

D. Check, Test and Start reports.

1.10 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Begin compiling data upon approval of submittals.

a. Sets shall incorporate the following:

1) Product Data.
2) Shop Drawings.
3) Record Drawings.
4) Service telephone number, address and contact person for each category of equipment or system.
5) Complete operating instructions for each item of heating, ventilating and air conditioning equipment.
6) Copies of guarantees/warrantees for each item of equipment or systems.
7) Test data and system balancing reports.
8) Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
9) Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
10) Temperature control diagrams and literature.
11) Check test and start reports for each piece of mechanical equipment provided as part of the Work.
12) Commissioning and Preliminary Operation Tests required as part of the Work.

2. Post service telephone numbers and addresses in an appropriate place designated by Architect.

B. Record Drawings:

1. Refer to Division 01 for additional requirements.

2. Upon completion of the Work, deliver to Architect the following:

    a. Originals of drawings showing the Work exactly as installed.
    b. One complete set of reproducible drawings showing the Work exactly as installed.
    c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
    d. Provide Contractor's signature, verifying accuracy of record drawings.
    e. Obtain the signature of the Inspector of Record for Record Drawings.

1.11 SUBSTITUTIONS

A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In case of conflict between requirements given herein and those of Division 01, Division 01 requirements shall apply.

B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.

C. Substitutions will be interpreted to be manufacturers other than those specifically listed in the Contract Documents by brand name, model, or catalog number.

D. Only one request for substitution will be considered for each item of equipment or material.

E. Substitution requests shall include the following:

    1. Reason for substitution request.
    2. Complete submittal information as described herein; see "Submittals."
    3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
    4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
    5. Explanation of impact on connected utilities.
    6. Explanation of impact on structural supports.

F. Installation of reviewed substitution is Contractors' responsibility. Any mechanical, electrical, structural, or other changes required for installation of substituted equipment or material must be made by Contractor without additional cost to Owner. Review by Architect of substituted equipment or material, will not waive these requirements.

G. Contractor may be required to compensate Architect for costs related to substituted equipment or material.

1.12 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of HVAC systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with HVAC systems work similar to that required for this Project.

C. Comply with applicable portions of California Mechanical Code pertaining to selection and installation of HVAC materials and products.

D. All materials and products shall be new.

1.13 DELIVERY, STORAGE, AND HANDLING

A. Protect equipment and materials delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

1.14 FIELD CONDITIONS

A. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

1.15 WARRANTY

A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor’s Standard Guarantee.

B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.

C. On failure to comply with warranty requirements within a reasonable length of time after notification is given, Architect/Owner shall have repairs made at Contractor's expense.

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.

B. All sizes, capacities, and efficiency ratings shown are minimum, except that gas capacity is maximum available.

C. Refer to Division 22 10 00 and 23 80 00 for specific system piping materials.

2.2 MATERIALS

A. No material installed as part of this Work shall contain asbestos.

B. California Green Building Code Compliance:

1. HVAC and refrigeration equipment shall not contain CFCs.
2. HVAC and refrigeration equipment shall not contain Halons.

2.3 ELECTRIC MOTORS

A. General Motor Requirements: Comply with NEMA MG 1 unless otherwise indicated. Comply with IEEE 841 for severe-duty motors.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. U.S. Motors.
b. Century Electric.
c. General Electric.
d. Lincoln.
e. Gould.

B. Motor Characteristics: Designed for continuous duty at ambient temperature of 40 deg. C and at altitude of 3300 feet above sea level. Capacity and torque shall be sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

1. Motors exceeding the nameplate amperage shall be promptly replaced at no cost to the Owner. Horsepower shown is minimum and shall be increased as necessary to comply with above requirements. Furnish motors with splash-proof or weatherproof housings, where required or recommended by the manufacturer. Match the nameplate voltage rating with the electrical service supplied. Check Electrical Drawings. Provide a transformer for each motor not wound specifically for system voltage.

C. Polyphase Motors: NEMA MG 1, Design B, medium induction motor, premium efficiency as defined in NEMA MG 1. Select motors with service factor of 1.15. Provide motor with random-wound, squirrel cage rotor, and permanently lubricated or regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading. Temperature rise shall match insulation rating. Provide Class F insulation.

1. Multispeed motors shall have separate windings for each speed.

D. Polyphase Motors with Additional Requirements:

1. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
2. Motors Used with Variable Frequency Controllers:

a. Separately Connected Motors: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
b. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
c. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
d. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
e. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
f. Each motor shall be provided with a shaft grounding device for stray current protection.

3. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

E. Single-Phase Motors:

1. Select motors with service factor of 1.15.

2. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

a. Permanent-split capacitor.
b. Split phase.
c. Capacitor start, inductor run.
d. Capacitor start, capacitor run.

3. Motors for HVAC exhaust, transfer, and supply fans larger than 1/12 hp and smaller than 1 hp shall be the following:

a. Electronically Commutated motor (EC type): Motor shall be electronically commutated type specifically designed for applications, with heavy duty ball bearings. The motor shall be speed controllable down to 20% of full speed and 85% efficient at all speeds.

1) Exceptions:

a) Motors in fan-coils and terminal units that operate only when providing heating to the space served.
b) Motors installed in space conditioning equipment certified under California Energy Code Section 110.1 or 110.2.

4. Contractor’s Option: Motors scheduled on Drawings as single-phase, and larger than 1/12 hp and smaller than 1 hp, for applications other than HVAC fans, may be EC type.
5. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
6. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
7. Motors 1/20 HP and Smaller: Shaded-pole type.
8. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature

rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.4 MOTOR STARTERS

A. Square D, Allen Bradley, or equal, in NEMA Type 1 enclosure, unless otherwise specified or required. Minimum starter size shall be Size 1. Provide NEMA 3R enclosure where exposed to outdoors.

B. Provide magnetic motor starters for all equipment provided under the Mechanical Work. Starters shall be non-combination type. Provide part winding or reduced voltage start motors where shown or as hereinafter specified. Minimum size starter shall be Size 1.

1. All starters shall have the following:

a. Cover mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.
b. Ambient compensated thermal overload.
c. Fused control transformer (for 120 or 24 volt service).
d. Pilot lights, integral with the starters. Starters located outdoors shall be in NEMA IIIR enclosures.

2. Where three phase motors are provided for two-speed operation, provide two speed motor starters.
3. Starters for single-phase motors shall have thermal overloads. NEMA I enclosure for starters located indoors, NEMA IIIR enclosure for starters located outdoors.
4. Provide OSHA label indicating the device starts automatically.

2.5 STRAINERS

A. Charles M. Bailey #100A, Armstrong, Muessco, or equal, Fig. 11 "Y" pattern, 125 psi WP minimum, with monel screens with 20 square mesh for 2 inches and smaller and 3/64 inch perforations for 2-1/2 inches and larger. Install all strainers with a blow-off hose valve with hose adapter. Strainer shall have gasketed cover with straight thread.

2.6 GAUGES

A. Marsh "Series J", U.S. Gage, Danton 800, or equal, with bronze bushed movement and front recalibration. Dials shall be white with black numerals, 3-1/2 inch dial face. Normal reading shall be at mid-scale. Provide a needle valve on each gauge connection. Supply a gauge piped with branch isolation valves across the inlet and outlet of each pump and where shown on the Drawings.

B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core {and gasketed cap}, on inlet and outlet of each coil, boiler, condenser, chiller and heat exchanger and where shown on Drawings.

2.7 THERMOMETERS

A. Marsh, Taylor, Palmer, or equal, 5 inch diameter bimetal dial, adjustable from face, with adjustable positioner, located to be easily read from normal personnel approach. Normal reading shall be at mid-scale.

1. Provide extension for insulation.
2. Provide thermometers with steel bulb chambers and brass separable sockets.
3. Thermometers for air temperature shall have 8 inch minimum stem.

B. Provide Ventlock, Durodyne, or equal thermometer test holes at each air conditioning unit, furnace, and make-up air unit, in mixed air and supply air, and at all locations shown or scheduled on the Drawings. Provide two portable thermometers, with sensing connection arranged to suit test connections.

C. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core, on inlet and outlet of each coil, boiler, condenser, chiller and heat exchanger and provide two digital electronic test thermometers for each range of fluid temperature and where shown on Drawings.

2.8 ACCESS DOORS

A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.

1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.

B. Access doors shall match those supplied in Division 08 in all respects, except as noted herein.

C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.

D. Where panels are located on ducts or plenums, provide neoprene gaskets to prevent air leakage, and use frames to set door out to flush with insulation.

E. Provide insulated doors where located in internally insulated ducts or casings.

F. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.

G. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.

H. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:

1. Milcor

    a. Style K (plaster).
    b. Style DW (gypsum board).
    c. Style M (Masonry).
    d. Style "Fire Rated" where required.

2.9 FLEXIBLE JOINTS

A. Where indicated on Drawings, provide Metraflex Metrasphere, Style R, Mason Industries, or equal, Spherical Expansion Joints. Provide control units at each expansion joint, arranged to limit both expansion and compression.

B. Flexible joints at entry points to building shall be Barco Ductile iron, Advanced Thermal Systems, or equal, threaded style with stainless ball and mineral filled seal.

2.10 PIPE GUIDES

A. Where flexible connections are indicated on Drawings, provide Metraflex style IV, B-Line, or equal, pipe guides in locations recommended by manufacturer. Maximum spacing from flexible connection to first pipe guide is 4 pipe diameters, and maximum spacing from second pipe guide is 14 pipe diameters.

2.11 EQUIPMENT IDENTIFICATION

A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

2.12 PIPE IDENTIFICATION

A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.

B. The legend and flow arrow shall conform to ASME A13.1.

PART 3 - EXECUTION

3.1 FRAMING, CUTTING, AND PATCHING

A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.

B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.

3.2 ELECTRICAL REQUIREMENTS

A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.

B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.

C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

3.3 PIPING SYSTEM REQUIREMENTS

A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

3.4 PRIMING AND PAINTING

A. Perform priming and painting on the equipment and materials as specified herein.

B. See Division 09 Painting Section(s) for detailed requirements.

C. Priming and painting:

1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.

    a. Black Steel Piping:

        1) Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.
        2) Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.

    b. Interior Ductwork: Refer to Division 09 Painting Section(s). Architect shall select paint color.

2. Metal surfaces of items to be jacketed or insulated except ductwork and piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the best available

grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.

3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

3.5 EXCAVATING

A. Perform all excavating required for work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.

B. Unless shown otherwise, provide a minimum of 2'-6" cover above top of pipe to finished grade for all service piping, unless otherwise noted. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For all PVC pipe and for PE gas pipe, bed the pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. All other materials should have a minimum sand equivalent of 50. Only a small proportion of the native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such 100 percent of the material will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.

C. Maintain all warning signs, barricades, flares, and red lanterns as required.

D. For all trenches 5 feet or more in depth, submit copy of permit detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trenches. Obtain a permit from the Division of Industrial Safety prior to beginning excavations. A copy of the permit shall be available at the site at all times.

3.6 BACKFILLING

A. Backfill shall comply with applicable provisions of Division 31 of these Specifications.

B. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.

1. Backfill plastic pipe and insulated pipe with sand for a minimum distance of 12 inches above the top of the pipe. Compact using mechanical tamping equipment.

C. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase the minimum compaction within the uppermost two feet of backfill to 95 percent.

D. Replace or repair to its original condition all sod, concrete, asphalt paving, or other materials disturbed by the trenching operation. Repair within the guarantee period as required.

3.7 UNION AND FLANGE INSTALLATION

A. Install Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel or cast iron pipe or material except in drain piping. Bushings or couplings shall not be used.

B. Install unions in piping NPS 2” and smaller 3 or flanges in piping NPS 2-1/2” and larger whether shown or not at each connection to all equipment and tanks, and at all connections to all automatic valves, such as temperature control valves.

C. Locate the unions for easy removal of the equipment, tank, or valve.

D. Do not install unions or flanges in refrigerant piping systems.

3.8 ACCESS DOOR INSTALLATION

A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers, traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

3.9 CONCRETE WORK

A. Concrete work required for work of this Section shall be included under another section of the Specification, unless otherwise noted, including poured-in-place concrete work for installing precast manholes, catch basins, etc., and shall include reinforced concrete bases for pumps, tanks, compressors, fan units, boilers, unless the work is specifically indicated on the Drawings to be furnished under this Section.

B. Underground anchors, and pads for valve access boxes are included under this Section of the Specification. Concrete shall be 3000 psi test minimum. Refer to Division 03 for concrete types.

3.10 PIPE PROTECTION

A. Wrap bare galvanized and black steel pipe buried in the ground and to 6" above grade, including piping in conduit, with one of the following, or equal:

1. Polyethylene Coating: Pressure sensitive polyethylene coating, "X-Tru-Coat" as manufactured by Pipe Line Service Corporation or "Green Line" wrap as manufactured by Roystron Products, or equal.

    a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Roystron Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.

2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-l0 or V-20", "Scotchwrap 50", Slipknot l00, PASCO Specialty & Mfg., Inc., or equal, with continuous identification. Tape shall be a minimum of 20 mils thick for fittings and irregular surfaces, two wraps, 50 percent overlap, 40 mils total thickness. Tape shall be laminated with a suitable adhesive; widths as recommended by the manufacturer for the pipe size. Wrap straight lengths of piping with an approved wrapping machine.

B. Field Joints: Valves and Fittings: double wrap polyvinyl chloride tape as above. Provide at least two thicknesses of tape over the joint and extend a minimum of 4 inches over adjacent pipe covering. Build up with primer to match adjacent covering thickness. Width of tape of fittings shall not exceed 3 inches. Tape shall adhere tightly to all surfaces of the fittings without air pockets.

C. Testing: Test completed wrap of piping, including all epoxy painted piping with Tinker and Rasor Co. holiday detector, or equal.

D. Cleaning: Clean all piping thoroughly before wrapping.

1. Inspection: Damaged or defective wraps shall be repaired as directed. No wrapped pipe shall be covered until approved by Architect.

E. Covering: No rocks or sharp edges shall be backfilled against the wrap. When backfilling with other than sand, protect wrap with an outer wrapping of Kraft paper; leave in place during backfill.

3.11 PIPE IDENTIFICATION

A. Provide temporary identification of each pipe installed, at the time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the work.

B. Apply the legend and flow arrow at all valve locations; at all points where the piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction, and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with the approval of the Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.

1. Apply legend and flow arrow at approximately 10’-0” intervals in science classrooms and science prep rooms.

C. Wherever two or more pipes run parallel, the markings shall be supplied in the same relative location on each.

D. Each valve on non-potable water piping shall be labeled with a metal tag stamped "DANGER -- NON-POTABLE WATER" in 1/4 inch high letters.

E. Apply the markings after painting and cleaning of piping and insulation is completed.

3.12 EXPANSION ANCHORS IN HARDENED CONCRETE

A. Qualification Tests: The specific anchor shall have a current ICC-ES report and evaluated in cracked concrete in accordance with Acceptance Criteria AC193. If the specific anchor satisfies cyclic testing requirements per Acceptance Criteria AC01, Section 5.6, the full allowable shear and tension loads listed in the current ICC-ES report and manufacturer's recommendations for the specific anchor may be used. Otherwise, the design shear and tension loads shall not be more than 80% of the listed allowable shear and tension loads for the specific anchor.

B. Installation: The anchors must be installed in accordance with the requirements given in ICC Research Committee Recommendations for the specific anchor.

C. Testing: Fifty percent of the anchors shall be load-tested on each job to twice the allowable capacity in tension, except that if the design load is less than 75 pounds; only one anchor in ten need be tested. If any anchor fails, all anchors must be tested. The load test shall be performed in the presence of a special inspector.

D. The load may be applied by any method that will effectively measure the tension in the anchor, such as direct pull with a hydraulic jack, a torque wrench calibrated using the specific anchor or calibrated spring-loading devices. Anchors in which the torque is used to expand the anchor without applying tension to the bolt may not be verified with a torque wrench.

3.13 PIPING SYSTEM PRESSURE TESTING

A. General:

1. Perform operational tests under simulated or actual service conditions.
2. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

B. Piping Systems: Test the installations in accordance with the following requirements and applicable codes:

1. Notify the Architect at least seven days in advance of testing.
2. Authority having jurisdiction shall witness tests of piping systems.
3. Piping shall be tested at completion of roughing-in, or at other times as directed by the Architect.
4. Furnish necessary materials, test pumps, gases, instruments and labor required for testing.
5. Isolate from system equipment that may be damaged by test pressure.

6. Test Schedule: No loss in pressure or visible leaks shall show after four hours at the pressures indicated.

System Tested	Test Pressure PSI	Test With
All Hot, Chilled, Combination, Condenser Water Piping	Greater of 1-1/2 x WP or 100 psi	Water

C. Testing, Evacuating, Charging and Lubrication of Refrigeration Systems:

1. Pressurize with dry nitrogen and/or refrigerant to 300 psig and test all joints with an electronic detector or halide torch. Release the pressure and attach a high vacuum pump. Evacuate to 4 mm (4000 microns) and hold for 30 minutes. Break to 5 psig with dry nitrogen and allow to remain in the system for ten minutes. Evacuate to 2 mm (2000 microns) and hold for 30 minutes. Use a mercury manometer or electronic vacuum gauge. Do not start timing until recommended vacuum range is reached.
2. At the end of the evacuation, if the system has been proved leak-free, charge with refrigerant and fill the crankcase to the oil level specified by the manufacturer. All refrigerant oil shall be delivered to the location in sealed containers.
3. Replenish for a period of one year without cost to the Owner all refrigerant and oil required to maintain the proper levels.

3.14 TRACER WIRE INSTALLATION

A. Provide tracer wire for non-metallic water pipe in ground outside of buildings. Use AWG #14 tracer wire with blue colored low density high molecular weight polyethylene insulation, and lay continuously on pipe so that it is not broken or stressed by backfilling operations. Secure wire to the piping with tape at 18 inch intervals. Solder all joints.

B. Terminals: Precast concrete box and cast iron locking traffic cover, Brooks 3TL, or equal; cover marked with name of service; 6 inches of loose gravel below box. Plastic terminal board with brass bolts; identify line direction with plastic tags. Test for continuity between terminals, after backfilling, in presence of Inspector.

C. Alternate: Use electronically detectable plastic tape with metallic core, Terra Tape D, manufactured by Reef Industries, Inc., Seton, Inc., Marking Services, Inc., or equal; tape 2 inches wide, continuously imprinted "CAUTION WATER (GAS, etc.) LINE BELOW". Install, with printed side up, directly over pipe, 18 inches below finish grade. Backfill material shall be as previously specified for the particular condition where pipe is installed, but avoid use of crushed rock or of earth with particles larger than l/2 inch within the top 12 inches of backfill. Take precautions to insure that tape is not damaged or misplaced during backfill operations. Terminal boxes not required.

3.15 OPERATION OF SYSTEMS

A. Do not operate any mechanical equipment for any purpose, temporary or permanent, until all of the following has been completed:

1. Complete all requirements listed under “Check, Test and Start Requirements.”

2. Ductwork and piping has been properly cleaned. Piping systems shall be flushed and treated prior to operation.
3. Filters, strainers etc. are in place.
4. Bearings have been lubricated, and alignment of rotating equipment has been checked.
5. Equipment has been run under observation, and is operating in a satisfactory manner.

B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.

C. Operate every fire damper, smoke damper, combination smoke and fire damper under normal operating conditions. Activate smoke detectors as required to operate the damper, stage fan, etc. Provide written confirmation that all systems operate in a satisfactory manner.

3.16 TEMPORARY HEAT

A. The General Contractor will provide for all temporary heat at such times as may be required or directed by the Architect and pay all fuel and energy costs incurred.

B. Temporary heating facilities proposed for use by the Contractor will be subject to review of the Architect. Prior to use of any equipment for temporary heat, install temporary filters on all return air inlets, to preclude dust and construction debris from entering the duct system. In addition, install filters in air handling units, and replace at the completion of temporary operation.

C. Filters used for temporary operation of systems shall be as specified for permanent filters specified herein.

D. Comply with Check, Test and Start Requirements for start-up of equipment prior to operation for temporary heat.

E. Contractor shall complete the permanent heating system as soon as possible, thereby making it available for temporary heat. When available, the system may be used as required at the direction of the Architect after systems are properly prepared for use as specified elsewhere. Contractor shall then be responsible for operating the system during periods required and the General Contractor shall pay the fuel and energy costs incurred. Operation of the heating system prior to the filing of "notice of completion" shall not change the Guarantee provisions in any way.

3.17 CHECK, TEST AND START REQUIREMENTS

A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of mechanical equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.

1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.
2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
4. When work has been completed, provide copies of reports for review, prior to final observation of work.

B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.

C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each Operation and Maintenance Manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

3.18 PRELIMINARY OPERATIONAL REQUIREMENTS AND TESTS

A. Prior to observation to determine final acceptance, put HVAC, plumbing, and fire protection systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.

1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations, including modulating power exhausts if present.
2. Correct rotation of motors and ratings of overload heaters are verified.
3. Specified filters are installed and spare filters have been turned over to Owner.
4. All manufacturers' certificates of start-up specified have been delivered to the Owner.
5. All equipment has been cleaned, and damaged painted finishes touched up.
6. Damaged fins on heat exchangers have been combed out.
7. Missing or damaged parts have been replaced.
8. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.
9. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
10. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
11. Preliminary test and balance work is complete, and reports have been forwarded for review.
12. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.
13. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.

B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.

1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.
2. Include operation of heating and air conditioning equipment and systems for a period of not less than two 8 hour days at not less than 90 percent of full specified heating and cooling capacities in tests.
3. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.
4. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.
5. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.

C. Before handing over the system to Owner replace all filters with complete new set of filters.

D. Review of Contractor's Tests:

1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.

E. Test Logs:

1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.

F. Preliminary Operation:

1. The Owner reserves the right to operate portions of the mechanical system on a preliminary basis without voiding the guarantee.

G. Operational Tests:

1. Before operational tests are performed, demonstrate that all systems and components are complete and fully charged with operating fluid and lubricants.
2. Systems shall be operable and capable of maintaining continuous uninterrupted operation during the operating and demonstration period. After all systems have been completely installed, connections made, and tests completed, operate the systems continuously for a period of five working days during the hours of a normal working day.

3. This period of continuous systems operation may be coordinated with the removal of Volatile Organic Compounds (VOCs) from the building prior to occupancy should the Owner decide to implement such a program.
4. Control systems shall be completely operable with settings properly calibrated and adjusted.
5. Rotating equipment shall be in dynamic balance and alignment.
6. If the system fails to operate continuously during the test period, the deficiencies shall be corrected and the entire test repeated.

H. Pre-Occupancy Building Purge:

1. Prior to occupancy, ventilate the building on 100 percent outside air, 100 percent exhaust for a continuous period determined by a qualified industrial hygienist (engaged by the Contractor) to reduce V.O.C's prior to occupancy.
2. Submit report by the industrial hygienist verifying satisfactory completion of the pre-occupancy purge.

3.19 DEMONSTRATION AND TRAINING

A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.

1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.
2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner's representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:

    a. Listing of Owner-designated personnel completing training, by name and title.
    b. Name and title of training instructor.
    c. Date(s) of training.
    d. List of topics covered in training sessions.

4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

END OF SECTION 23 00 50

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.
b. Variable-air-volume systems.

2. Balancing Domestic Water Piping Systems.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 REFERENCES AND STANDARDS

A. Associated Air Balance Council (AABC)

1. National Standards for Total System Balance, latest edition.

B. National Environmental Balancing Bureau (NEBB)

1. Procedural Standards for Testing and Balancing of Environmental Systems, latest edition.

1.4 DEFINITIONS

A. The intent of this Section is to use the standards pertaining to the TAB specialist engaged to perform the Work of this Contract, with additional requirements specified in this Section. Contract requirements take precedence over corresponding AABC or NEBB standards requirements. Differences in terminology between the Specifications and the specified TAB organization standards do not relieve the TAB entity engaged to perform the Work of this Contract of responsibility from completing the Work as described in the Specifications.

B. Similar Terms: The following table is provided for clarification only:

Similar Terms		
Contract Term	AABC Term	NEBB Term
TAB Special-ist	TAB Agency	NEBB Certified Firm
TAB Standard	National Standards for Testing and Balancing Heating, Venti-lating, and Air Conditioning Systems	Procedural Standards for Testing, Adjusting, and Balancing of Envi-ronmental Systems
TAB Field Supervisor	Test and Balance Engineer	Test and Balance Supervisor

C. AABC: Associated Air Balance Council.

D. NEBB: National Environmental Balancing Bureau.

E. TAB: Testing, adjusting, and balancing.

F. TAB Organization: Body governing practices of TAB Specialists.

G. TAB Specialist: An entity engaged to perform TAB Work.

1.5 ACTION SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

1.6 INFORMATIONAL SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

1. Provide list of similar projects completed by proposed TAB field supervisor.
2. Provide copy of completed TAB report, approved by mechanical engineer of record for a completed project with similar system types and of similar complexity.

C. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

1. Submit examinations report with qualifications data.

D. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

E. Interim Reports. Submit interim reports as specified in Part 3. Include list of system conditions requiring correction and problems not identified in Contract Documents examination report.

F. Certified TAB reports.

1. Provide three printed copies of final TAB report. Provide one electronic file copy in PDF format.

G. Sample report forms.

H. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

a. Instruments to be used for testing and balancing shall have been calibrated within a period of one year, or less if so recommended by instrument manufacturer and be checked for accuracy prior to start of work.

1.7 CLOSEOUT SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. Certified TAB reports, for inclusion in Operation and Maintenance Manual.

1.8 QUALITY ASSURANCE

A. Independent TAB Specialist Qualifications: Engage a TAB entity certified by AABC or NEBB.

1. The certification shall be maintained for the entire duration of TAB work for this Project. If TAB specialist loses certification during this period, the Contractor shall immediately notify the Architect and submit another TAB specialist for approval. All work specified in this Section and in other related Sections performed by the

TAB specialist shall be invalidated if the TAB specialist loses certification, and shall be performed by an approved successor.

B. To secure approval for the proposed TAB specialist, submit information certifying that the TAB specialist is either a first tier subcontractor engaged and paid by the Contractor, or is engaged and paid directly by the Owner. TAB specialist shall not be affiliated with any other entity participating in Work of this Contract, including design, furnishing equipment, or construction. In addition, submit evidence of the following:

1. TAB Field Supervisor: Full-time employee of the TAB specialist and certified by AABC or NEBB.

a. TAB field supervisor shall have minimum 10 years supervisory experience in TAB work.

2. TAB Technician: Full-time employee of the TAB specialist and who is certified by AABC or NEBB as a TAB technician.

a. TAB technician shall have minimum 4 years TAB field experience.

C. TAB Specialist engaged to perform TAB work in this Project shall be a business limited to and specializing in TAB work, or in TAB work and Commissioning.

D. TAB specialist engaged to perform TAB work shall not also perform commissioning activities on this Project.

E. Certified TAB field supervisor or certified TAB technician shall be present at the Project site at all times when TAB work is performed.

1. TAB specialist shall maintain at the Project site a minimum ratio of one certified field supervisor or technician for each non-certified employee at times when TAB work is being performed.

F. Contractor shall notify Architect in writing within three days of receiving direction resulting in reduction of test and balance scope or other deviations from Contract Documents. Deviations from the TAB plan shall be approved in writing by the mechanical engineer of record for the Project.

G. TAB Standard:

1. Perform TAB work in accordance with the requirements of the standard under which the TAB agencies' qualifications are approved unless Specifications contain different or more stringent requirements:

a. AABC National Standards for Total System Balance, or

b. NEBB Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.

2. All recommendations and suggested practices contained in the TAB standard are mandatory. Use provisions of the TAB standard, including checklists and report forms, to the extent to which they are applicable to this Project.
3. Testing, adjusting, balancing procedures, and reporting required for this Project, and not covered by the TAB standard applicable to the TAB specialist engaged to perform the Work of this Contract, shall be submitted for approval by the design engineer.

H. TAB Conference: Meet with Architect and mechanical engineer on approval of the TAB strategies and procedures plan to develop a mutual understanding of the project requirements. Require the participation of the TAB field supervisor. Provide seven days' advance notice of scheduled meeting time and location. TAB conference shall take place at location selected by Architect offices of Capital.

1. Agenda Items:

a. The Contract Documents examination report.
b. The TAB plan.
c. Coordination and cooperation of trades and subcontractors.
d. Coordination of documentation and communication flow, including protocol for resolution tracking and documentation.

2. The requirement for TAB conference may be waived at the discretion of the mechanical engineer of record for the Project.

I. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

J. TAB Report Forms: Use standard TAB specialist's forms approved by Architect .

K. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

1.9 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.10 WARRANTY

A. Provide workmanship and performance warranty applicable to TAB specialist engaged to perform Work of this Contract:

1. AABC Performance Guarantee.
2. NEBB Quality Assurance Program.

B. Refer to Division 01 Specifications for additional requirements.

1.11 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

C. Coordinate TAB work with work of other trades.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contract Documents Examination Report:

1. TAB specialist shall review Contract Documents, including plans and specifications. Provide report listing conditions that would prevent the system(s) from operating in accordance with the sequence of operations specified, or would prevent accurate testing and balancing:

a. Identify each condition requiring correction using equipment designation shown on Drawings. Provide room number, nearest building grid line intersection, or other information necessary to identify location of condition requiring correction.
b. Proposed corrective action necessary for proper system operation.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

I. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

J. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

L. Examine system pumps to ensure absence of entrained air in the suction piping.

M. Examine operating safety interlocks and controls on HVAC equipment.

N. Report conditions requiring correction discovered before and during performance of TAB procedures.

O. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures. TAB plan shall be specific to Project and include the following:

1. General description of each air system and sequence(s) of operation.
2. Complete list of measurements to be performed.
3. Complete list of measurement procedures. Specify types of instruments to be utilized and method of instrument application.
4. Qualifications of personnel assigned to Project.
5. Single-line CAD drawings reflecting all test locations (terminal units, grilles, diffusers, traverse locations, etc.
6. Air terminal correction factors for the following:

    a. Air terminal configuration.
    b. Flow direction (supply or return/exhaust).
    c. Effective area of each size and type of air terminal.
    d. Air density.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, smoke, and fire dampers are open.
5. Isolating and balancing valves are open and control valves are operational.
6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
7. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 238000 Heating, Ventilating, and Air Conditioning.”

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Test each system to verify building or space operating pressure, including all stages of economizer cycle. Maximum building pressure shall not exceed 0.03 inches of pressure.

C. Except as specifically indicated in this Specification, Pitot tube traverses shall be made of each duct to measure airflow. Pitot tubes, associated instruments, traverses, and techniques shall conform to ASHRAE Handbook, HVAC Applications, and ASHRAE Handbook, HVAC Systems and Equipment.

1. Use state-of-the-art instrumentation approved by TAB specialists governing agency..
2. Where ducts' design velocity and air quantity are both less than 1000 fpm/CFM, air quantity may be determined by measurements at terminals served.

D. Test holes shall be placed in straight duct, as far as possible downstream from elbow, bends, take-offs, and other turbulence-generating devices.

E. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

F. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

G. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

H. Verify that motor starters are equipped with properly sized thermal protection.

I. Check dampers for proper position to achieve desired airflow path.

J. Check for airflow blockages.

K. Check condensate drains for proper connections and functioning.

L. Check for proper sealing of air-handling-unit components.

M. Verify that air duct system is sealed as specified in Section 238000 "Heating, Ventilating, and Air Conditioning."

N. Provide for adjustments or modifications to fan and motor sheaves, belts, damper linkages, and other components as required to achieve specified air balance at no additional cost to Owner.

O. Automatically operated dampers shall be adjusted to operate as indicated in Contract Documents. Controls shall be checked for proper calibration.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow. Alternative methods shall be examined for determining total CFM, i.e., Pitot-tube traversing of branch ducts, coil or filter velocity profiles, prior to utilizing airflow values at terminal outlets and inlets.

2. Measure fan static pressures as follows to determine actual static pressure:

    a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

    a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Check operation of relief air dampers. Measure total relief air quantity at each stage of normal, economizer, power exhaust, or power exhaust economizer operation, as applicable to installed equipment. Adjust relief air dampers to provide 100 percent relief in economizer mode. Ensure that relief dampers close completely upon unit shutdown.

C. Check operation of outside air dampers. Measure total outside air quantity at each stage of normal, economizer, power exhaust, or power exhaust economizer operation, as applicable to installed equipment. Adjust outside air dampers to provide 100 percent outside air in economizer mode. Ensure that outside air dampers close completely upon unit shutdown.

D. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

E. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading digital backflow compensating hood. Use outlet manufacturer's written instructions and calculating factors only when direct-reading hood cannot be used due to physical obstruction or other limiting factors. Final report shall indicate where values listed have not been obtained by direct measurement.

F. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents, if included.
2. Adjust patterns of adjustable outlets for proper distribution without drafts. Terminal air velocity at five feet above finished floor shall not exceed 50 feet per minute in occupied air conditioned spaces.

G. Do not overpressurize ducts.

3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Comply with applicable requirements for constant-volume air systems in addition to those listed below.

B. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum-airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

C. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set outdoor-air dampers at minimum, and set return- and exhaust-air dampers at a position that simulates full-cooling load.
2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering

static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.

3. Measure total system airflow. Adjust to within indicated airflow.
4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.

6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

    a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
8. Record final fan-performance data including optimum operating static control set point.

3.7 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter manufacturer’s name, model number, size, type, and thermal-protection-element rating.

    a. Starter strip heater size, type, and rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.8 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.9 GENERAL PROCEDURES FOR PLUMBING SYSTEMS

A. Measure pressure drop across each backflow preventer assembly at design flows.

B. Measure water flow at pumps. Use the following procedures except for positive-displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.

    a. If impeller sizes must be adjusted to achieve pump performance, obtain approval from Architect Owner Construction Manager and comply with requirements in Section 225000 “Plumbing Equipment

2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.

    a. Monitor motor performance during procedures and do not operate motors in overload conditions.

3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
4. Report flow rates that are not within range given in article, Tolerances.

C. Set calibrated balancing valves, if installed, at calculated presettings.

D. Measure flow at all stations and adjust, where necessary, to obtain first balance.

1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

E. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.

F. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:

1. Determine the balancing station with the highest percentage over indicated flow.
2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
3. Record settings and mark balancing devices.

G. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.

H. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.

I. Check settings and operation of each safety valve. Record settings.

3.10 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 10 percent and minus 0 percent .
2. Air Outlets and Inlets: Plus 5 percent and minus 5 percent .
3. Multiple outlets within single room: Plus 5 percent and minus 0 percent for total airflow within room. Tolerance for individual outlets within a single room having multiple outlets shall be as for “Air Outlets and Inlets”.

4. Heating-Water Flow Rate: Plus or minus 10 percent .
5. Cooling-Water Flow Rate: Plus or minus 10 percent .

B. Set plumbing systems water flow rates within plus or minus 10 percent.

3.11 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Interim Reports: Prepare periodic lists of conditions requiring correction and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.12 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing field supervisor. Report shall be co-signed by the Contractor, attesting that he has reviewed the report, and the report has been found to be complete and accurate.
2. The certification sheet shall be followed by sheet(s) listing items for which balancing objectives could not be achieved. Provide explanation for failure to achieve balancing objectives for each item listed.
3. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Project Performance Guaranty
6. Architect's name and address.
7. Engineer's name and address.
8. Contractor's name and address.
9. Report date.
10. Signature of TAB supervisor who certifies the report.
11. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
12. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

13. Nomenclature sheets for each item of equipment.
14. Data for terminal units, including manufacturer's name, type, size, and fittings.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.

c. Cooling coil, wet- and dry-bulb conditions.
d. Face and bypass damper settings at coils.
e. Fan drive settings including settings and percentage of maximum pitch diameter.
f. Inlet vane settings for variable-air-volume systems.
g. Settings for supply-air, static-pressure controller.
h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air distribution outlets and inlets shall be shown on keyed plans with designation for each outlet and inlet matching designation used in Contract Documents and TAB test reports. Room numbers shall be included in keyed plans and test reports. Where multiple outlets and inlets are installed within a single room, a designation shall be assigned and listed for each outlet and inlet in addition to room number.

F. Test Reports – General:

1. All test reports containing air or liquid flow data shall record flow values prior to system adjustment in addition to required data listed for each test report.

G. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches, and bore.
i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.

b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Relief airflow in cfm.
l. Outdoor-air damper position, normal and economizer, power exhaust, or power exhaust economizer modes, as applicable to installed equipment.
m. Return-air damper position.
n. Relief-air damper position, normal and economizer, power exhaust, or power exhaust economizer modes, as applicable to installed equipment.
o. Vortex damper position.

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

I. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft..
g. Indicated air flow rate in cfm.
h. Indicated velocity in fpm.
i. Actual air flow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

J. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Air velocity in fpm.
c. Preliminary air flow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final air flow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

K. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

    a. System and air-handling-unit identification.
    b. Location and zone.
    c. Room or riser served.
    d. Coil make and size.
    e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

    a. Air flow rate in cfm.
    b. Entering-water temperature in deg F.
    c. Leaving-water temperature in deg F.
    d. Water pressure drop in feet of head or psig.
    e. Entering-air temperature in deg F.
    f. Leaving-air temperature in deg F.

L. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Service.
    d. Make and size.
    e. Model number and serial number.
    f. Water flow rate in gpm.
    g. Water pressure differential in feet of head or psig.
    h. Required net positive suction head in feet of head or psig.
    i. Pump rpm.
    j. Impeller diameter in inches.
    k. Motor make and frame size.
    l. Motor horsepower and rpm.
    m. Voltage at each connection.
    n. Amperage for each phase.
    o. Full-load amperage and service factor.
    p. Seal type.

2. Test Data (Indicated and Actual Values):

    a. Static head in feet of head or psig.
    b. Pump shutoff pressure in feet of head or psig.
    c. Actual impeller size in inches.
    d. Full-open flow rate in gpm.
    e. Full-open pressure in feet of head or psig.
    f. Final discharge pressure in feet of head or psig.

g. Final suction pressure in feet of head or psig.
h. Final total pressure in feet of head or psig.
i. Final water flow rate in gpm.
j. Voltage at each connection.
k. Amperage for each phase.

M. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.13 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:

a. Measure airflow of at least 10 percent of air outlets.
b. Measure water flow of at least 5 percent of terminals.
c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
d. Verify that balancing devices are marked with final balance position.
e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect .
2. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Architect .
3. Architect shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than 10 percent, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contact the TAB specialists' governing organization for remedial action by the governing organization under the workmanship and performance warranty. See article, Warranty.
3. If remedial action is not provided by the TAB specialists' governing organization in a timely manner, Owner may contract the services of another TAB specialist to complete the TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB specialists' final payment.

D. Prepare test and inspection reports.

3.14 ADDITIONAL TESTS

A. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 23 09 23

DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnish all labor, materials, equipment, and service necessary for a complete and operating Native BACnet based Temperature Control System based upon the ANSI/ASHRAE™ Standard 135–2008, BACnet.

B. Provide all necessary hardware and software to meet the specified functional requirements.

C. Prepare individual hardware layouts, interconnection drawings and control loop configuration data from project design data.

D. Implement the detailed design for all system input/output points, distributed control and system data bases, graphic displays, logs, and management reports based on control descriptions, logic drawings, configuration data, and bid documents.

E. Provide and install all controllers, panels, and all interconnecting data communication network cables and all interconnecting cables between all operator terminals and peripheral devices (such as printers, etc.) called for in this section.

F. Provide as-built documentation, software, and all Direct Digital Control (DDC) control logic and all associated support documentation on approved media which accurately represents the final system.

G. Supply all equipment and accessories in accordance with the requirements of all applicable national, state and local codes.

H. Scheduled equipment performance is minimum capacity required.

I. Scheduled electrical capacity shall be considered as maximum available.

J. Unless noted otherwise, all conduit and wiring associated with the temperature control system, regardless of voltage, is included as part of this Section. Obtain power for temperature control devices from the nearest available adequate source.

K. Control system shall incorporate a California Energy Commission listed and approved fault detection and diagnostic (FDD) economizer controls and Title 24 requirements for HVAC operation with space occupancy sensors.

1.2 RELATED DOCUMENTS

A. MECHANICAL WORK - GENERAL REQUIREMENTS: Section 23 00 50

B. HEATING, VENTILATING AND AIR CONDITIONING: Section 23 80 00

C. GENERAL REQUIREMENTS, ELECTRICAL: Section 26 01 00

1.3 REFERENCES

A. CCR - California Code of Regulations, Title 24, Part 3, Basic Electrical Requirements, State Building Standards Electrical Code.

B. CEC - California Electrical Code

C. NEMA - National Electrical Manufacturer's Association

D. NFPA - 70 National Electrical Code (NEC)

E. UL - Underwriters Laboratories, Inc

1.4 SUBMITTALS

A. Submit eight copies of shop drawings of the entire control system. Provide point to point wiring diagrams and engineered drawings, complete list of equipment and materials including manufacturer's catalog cuts, and installation instructions. Provide a recommended spare parts list.

B. Provide complete wiring and schematic diagrams, software descriptions, calculations, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Indicate terminal identification for all control wiring on the shop drawings.

C. Provide a complete written Sequence of Operations with the submittal package.

D. Provide the following minimum system documentation:

E. System configuration diagrams in simplified block format.

F. Input / Output point and alarm point summary listing.

G. Electrical drawings showing all system internal and external connection points, terminal block layouts and terminal identification.

H. As part of Maintenance and Operating Data, provide manufacturer’s instructions and drawings for installation, maintenance and operation of all materials.

I. Overall system operation and maintenance instructions, including preventive maintenance and troubleshooting instructions.

J. Upon completion of the work provide a complete set of 'record' drawings including manufacturer's descriptive literature, operating instructions, and maintenance and repair data all in accordance with the requirements of Section 23 05 00.

K. Provide one CD ROM to the Owner with all Control System As-Built AutoCAD Drawings.

1.5 MANUFACTURER QUALITY ASSURANCE

A. All BACnet application specific controllers submitted for use on this project must be certified as complaint with BACnet through the BACnet Manufacturers’ Association (BMA) BACnet Testing Lab and must have a “BTL Mark”. The temperature control

system must be developed using existing proven equipment and must be readily available from inventory of the controls manufacturer or vendor at the time of bid.

B. Native BACnet System Manufacturer must have at a minimum 50 operating projects utilizing the proposed native BACnet System. Provide 10 references of similar projects (include project name, contact, phone number, location, consultant, value of contract, and a brief description of the control system and how it operates) and submit 45 days prior to bid for review process.

C. All controllers used on project must be of regular manufacturer and be readily available from inventory of the BACnet System Manufacturer.

D. Provide standard components, of regular manufacture for this application for all materials and equipment. All systems and components shall have been thoroughly tested and proven in actual use.

E. Operator workstation, if specified shall utilize Microsoft Windows 7 Professional or newer. All workstations and controllers shall be native BACnet devices. No 3rd party gateways shall be used for communication to controllers installed under this section.

F. Provide all necessary BACnet-compliant hardware and software to meet the system's functional specifications. Provide Protocol Implementation Conformance Statement (PICS) for Windows-based control software and every controller in the system.

G. All BACnet based peer-to-peer controllers, central system controllers and local user displays shall be UL listed under Standard UL 916, category PAZX.

H. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.

1.6 EMS SYSTEM CONTRACTOR QUALITY ASSURANCE

A. Responsibility: All work described in this section shall be engineered, installed, wired, circuit tested calibrated and programmed by regularly employed control system engineers and electricians and technicians of the authorized temperature control system factory representative or branch office of the listed approved manufacturer. System Engineering, Programming and Installation shall not be subcontracted. The supplier of the BACnet Temperature Control and Energy Management System shall be responsible for inspection and Quality Assurance (QA) for all materials and workmanship furnished by him. Contractor must have a valid C-10 and C-20 license to bid this project.

B. Component Testing and Availability: Maximum reliability shall be achieved through extensive use of high-quality, pre-tested components. The manufacturer prior to shipment shall individually test each and every controller, sensor, and all other DDC components. EMS System Contractor or Manufacturer must certify that any DDC part can be replaced within 5 working days.

C. Unacceptable Bids: Bids by wholesalers, parts distributors, contractors or franchised dealers or any firm whose principal business is not that of installing automatic temperature control systems shall not be acceptable.

D. Experience: Energy Management System Contractor (EMSC) shall have been in business and licensed by the State of California for a minimum of five continuous years prior to this project bid. EMSC must have been a factory authorized representative for a minimum of five years of the contractors proposed manufacturer's products and systems.

E. EMSC must have performed, from an office not more than 100 miles from project site at least 25 projects, each of which included the installation of not less than 250 hardware I/O points, using the contractors proposed manufacturer's products and systems. Five of the 25 projects must have included the installation of not less than 1,500 hardware I/O points using the contractors proposed manufacturer's products and systems.

F. EMSC shall have on staff a full time Mechanical Engineer that is a licensed Professional Engineer by the State of California, having not less than four years experience with the contractors proposed manufacturer's products and systems.

G. EMSC shall have on staff a full time Applications Engineer and Control System Programmer, having not less than three years experience with the contractors proposed manufacturer's products and systems.

H. EMSC shall have on staff a minimum of three full time control technicians, Senior control technician shall have not less than three years experience, junior technicians shall have not less than one years experience with the contractors proposed manufacturer's products and systems.

I. EMSC shall have a full time service department with service available 24 hours a day, seven days a week. Service department will have been established for a minimum of five years and be staffed with factory trained and authorized service technicians capable of servicing all aspects of the control systems depicted on these plans.

J. Service department shall have on staff a full time control system telephone support technician available during normal business hours dedicated to taking customer support calls and having the ability to call the project site and perform on-line diagnostics.

K. EMSC shall assign an in-house project manager to provide a detailed project design and installation schedule with time markings and details for hardware items and software development phases. Schedule shall show all the target dates for transmission of project information and documents and shall indicate timing and dates for system installation, debugging, and commissioning.

L. EMSC shall field verify existing controls that are to be reconnected to control system prior to design, submittal, and installation of work of this section. Notify Architect immediately of any discrepancies between field conditions and Work shown in the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. BACNet-based Direct Digital Control System: Acceptable Manufacturers, as listed below and meeting the criteria and requirements specified herein, will be acceptable:

1. Siemens.
2. ALC.
3. Alerton.
4. Johnson Metasys.
5. For manufacturers/products not listed, products must meet all requirements herein and comply with substitution requirements in Division 01.

2.2 OPERATOR'S WORKSTATION (Local user interface at Maintenance Office 543)

A. General structure of workstation interaction shall be a standard client/server relationship. Server shall be used to archive data and store system database. Clients shall access server for all archived data. Each client shall include flexibility to access graphics from server or local drive. Server shall support a minimum of 50 clients simultaneously.

B. BACnet Conformance

1. Operator's workstation shall as a minimum support Point-to-Point (PTP) and Ethernet BACnet LAN types. It shall communicate directly via these BACnet LANs as a native BACnet device. Operator's terminal shall comply with the requirements of a BACnet conformance class 3 device and support all BACnet services necessary to provide the following BACnet functional groups:
   a. Clock Functional Group
   b. Event Response Functional Group
   c. Time Master Functional Group
   d. Device Communications
2. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
3. Standard BACnet object types accessed by the workstation shall include as a minimum: Analog Value, Analog Input, Analog Output, Binary Value, Binary Input, Binary Output, Calendar, Device, Event Enrollment, File, Notification Class, Program and Schedule object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
4. The Operator Workstation shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to

other BACnet devices on the LAN. Must support interoperability on wide area networks (WANs) and campus area networks (CANs). Workstation shall support Foreign Device Registration to allow temporary workstation connection to IP network.

C. Displays

1. Operator's workstation shall display all data associated with project as called out on drawings and/or object type list supplied. Graphic background files shall be created using AutoCAD background files. System shall be capable of displaying graphic file, text, and dynamic object data together on each display and shall include animation. Information shall be labeled with descriptors and shall be shown with the appropriate engineering units. All information on any display shall be dynamically updated without any action by the user. Workstation shall allow user to change all field-resident BACnet System functions associated with the project, such as setpoints, weekly schedules, exception schedules, etc. from any screen no matter if that screen shows all text or a complete graphic display. This shall be done without any reference to object addresses or other numeric/mnemonic indications.
2. All displays and programming shall be generated and customized by the local BACnet System supplier and installer. Systems requiring factory development of graphics or programming of DDC logic are specifically prohibited.
3. Binary objects shall be displayed as ACTIVE/INACTIVE/NULL or with customized text. System shall be supplied with a library of standard graphics, which may be used unaltered or modified by the operator. Systems that do not allow customization or creation of new graphic objects by the operator (or with third-party software) shall not be allowed.
4. Analog objects shall be displayed with operator modifiable units. Analog input objects may also be displayed as individual graphic items on the display screen as an overlay to the system graphic. Pressing the button on the right side of the analog object spinner box allows direct entry of an analog value and accesses various menus where the analog value may be used, such as trend logs.
5. A mouse shall be used to move the pointer arrow to the desired item for selection of new display or to allow the operator to make changes to object data.

D. Password Protection

1. Provide security system that prevents unauthorized use unless operator is logged on. Access shall be limited to operator's assigned functions when user is logged on.
2. Each operator's terminal shall provide security for 200 users minimum. Each user shall have an individual User ID, User Name and Password. Entries are alphanumeric characters only and are case sensitive (except for User ID). User ID shall be 0–8 characters, User Name shall be 0–29 characters, and Password shall be 4–8 characters long. Each system user shall be allowed individual assignment of only those control functions and menu items to which that user requires access. All passwords, user names, and access assignments shall be adjustable online at the operator's terminal. Each user shall also have a set

security level, which defines access to displays and individual objects the user may control. System shall include 10 separate and distinct security levels.

3. System shall include an Auto Logout Feature that shall automatically logout user when there has been no keyboard or mouse activity for a set period of time. Time period shall be adjustable by system administrator.

E. Operator Activity Log

1. Operator Activity Log shall be included with system that tracks all operator changes and activities. System shall track what is changed in the system, who performed this change, date and time of system activity and value of the change before and after operator activity. Operator shall be able to display all activity, sort the changes by user and also by operation.
2. Log shall be gathered and archived to hard drive on operator workstation as needed. Operator shall be able to export data for display and sorting in a spreadsheet.
3. Any displayed data, that is changeable by the operator, may be selected using the right mouse button and the operator activity log shall then be selectable on the screen. Selection of the operator activity log using this method shall show all operator changes of just that displayed data.

F. Scheduling

1. Operator's workstation shall show all information in easy-to-read daily format including calendar of this month and next. All schedules shall show actual ON/OFF times for day based on scheduling priority. Priority for scheduling shall be events, holidays and daily with events being the highest.
2. Holiday and special event schedules shall display data in calendar format. Operator shall be able to schedule holidays and special events directly from these calendars.
3. Operator shall be able to change all information for a given weekly or exception schedule if logged on with the appropriate security access.
4. System shall include a Schedule Wizard for set up of schedules. Wizard shall walk user through all steps necessary for schedule generation. Wizard shall have its own pull-down selection for startup or may be started by right clicking on value displayed on graphic and then selecting Schedule.

G. Alarm Indication and Handling.

1. Operator's workstation shall provide audible, visual, and printed means of alarm indication. The alarm dialog box shall always become the top dialog box regardless of the application(s), currently running. Printout of alarms shall be sent to the assigned terminal and port.
2. System shall provide log of alarm messages. Alarm log shall be archived to the hard disk of the system operator's terminal. Each entry shall include a description of the event-initiating object generating the alarm. Description shall be an alarm message of at least 256 characters in length. Entry shall include time and date of alarm occurrence, time and date of object state return to normal,

time and date of alarm acknowledgment and identification of operator acknowledging alarm .

3. Alarm messages shall be in user-definable text (English or other specified language) and shall be entered either at the operator's terminal or via remote communication.

H. Trend log Information

1. System server shall periodically gather historically recorded data stored in the building controllers and archive the information Archived files shall be appended with new sample data, allowing samples to be accumulated. Systems that write over archived data shall not be allowed, unless limited file size is specified. Samples may be viewed at the operator's workstation. Operator shall be able to scroll through all trended data. All trend log information shall be displayed in standard engineering units.
2. Software shall be included that is capable of graphing the trend logged object data. Software shall be capable of creating two-axis (x,y) graphs that display up to ten object types at the same time in different colors. Graphs shall show object values relative to time.
3. Operator shall be able to change trend log setup information. This includes the information to be logged as well as the interval at which it is to be logged. All input, output, and value object types in the system may be logged. All operations shall be password protected. Setup and viewing may be accessed directly from any and all graphics on which object is displayed.

I. Demand Limiting

1. System shall include demand limiting program that includes two types of load shedding. One type of load shedding shall shed/restore equipment in binary fashion based on energy usage when compared to shed and restore settings. The other type of shedding shall adjust operator selected control setpoints in an analog fashion based on energy usage when compared to shed and restore settings. Shedding may be implemented independently on each and every zone or piece of equipment connected to system.
2. Binary shedding shall include minimum of 5 priority levels of equipment shedding. All loads in a given priority level shall be shed before any loads in a higher priority level are shed. Load shedding within a given priority level shall include two methods. In one the loads shall be shed/restored in a "first off-first on" mode and in the other the loads are just shed/restored in a linear fashion.
3. Analog shed program shall generate a ramp that is independently used by each individual zone or individual control algorithm to raise the appropriate cooling setting and lower appropriate heating setting to reduce energy usage.
4. Status of each and every load shed program shall be capable of being displayed on every operator terminal connected to system. Status of each load assigned to an individual shed program shall be displayed along with English description of each load.
    a. Property management information
    b. Overall billing rate

c. Seasonal adjustments or surcharge to billing rate

d. Billing notification type such including, but not limited to printer, file and email

e. Billing form template

5. Logging shall include recording the following information for each and every tenant event.

a. Zone description

b. Time the event begins

c. Total override time

d. Limits shall be applied to override time.

6. A tenant bill shall be generated for a specific period using all the entered configuration data and the logged data. User with appropriate security level shall be able to view and override billing information. User shall be able to select a billing period to look to view and be able to delete events from billing and be able to edit a selected tenant activity event's override time.

J. Configuration/Setup

1. Provide means for operator to display and change system configuration. This shall include, but not be limited to, system time, day of the week, date of daylight savings set forward/set back, printer termination, port addresses, modem port and speed, etc. Items shall be modified using understandable terminology with simple mouse/cursor key movements.

K. Field Engineering Tools

1. Operator's workstation software shall include field-engineering tools for programming all controllers supplied. All controllers shall be programmed using graphical tools that allow the user to connect function blocks on screen that provide sequencing of all control logic. Function blocks shall be represented by graphical displays that are easily identified and distinct from other types of blocks. Graphical programming that uses simple rectangles and squares is not acceptable.

2. User shall be able to pick graphical function block from menu and place on screen. Provide zoom in and zoom out capabilities. Function blocks shall be downloaded to controller without any reentry of data.

3. Programming tools shall include a real time operation mode. Function blocks shall display real time data and be animated to show status of data inputs and outputs when in real time operation. Animation shall show change of status on logic devices and countdown of timer devices in graphical format.

4. Field engineering tools shall also include a database manager of applications that include logic files for controllers and associated graphics. Operator shall be able to select unit type, input/output configuration and other items that define unit to be controlled. Supply minimum of 250 applications as part of workstation software.

5. Field engineering tool shall include Device Manager for automatic detection of devices connected anywhere on the BACnet network by scanning of the entire

network. This function shall display device instance, network identification, model number and description of connected devices. It shall record and display software file loaded into each controller. A copy of each file shall be stored on the computers hard drive. If needed, this file shall be downloaded to the appropriate controller by selection using the mouse.

6. System shall include backup/restore function that will back up entire system to selected medium and then restore system from that media.

L. Workstation/Server Hardware (Existing)

1. Server Hardware existing at District Office.

M. Software

1. At the conclusion of project, contractor shall leave with owner a CD ROM that includes the complete software operation system and project graphics, setpoints, system parameters, etc. This backup shall allow the owner to completely restore the system in the case of a computer malfunction.

2.3 Web Interface (New COMPASS ENTERPRISE SOFTWARE)

A. General – BACnet System supplier shall provide web-based access to the system as part of standard installation USING html-5. User shall be able to access all displays of real-time data that are part of the BACnet System via a standard Web browser. Web browser shall tie into the network via owner-supplied Ethernet network connection. Web-page host shall be a separate device that resides on the BACnet network, but is not the BACnet System Server for the control system. BACnet System Server must be a separate computer from the Web-page host device to ensure data and system integrity. The web-page software shall not require a per user licensing fee or annual fees. The web-page host must be able to support on average 50 simultaneous users with the ability to expand the system to accommodate an unlimited number of users.

B. Browser Technology - Browser shall be standard version of Microsoft IE 5.5 or later and Netscape Navigator 4.76 or later. No special vendor-supplied software shall be needed on computers running browser. All displays shall be viewable and the Web-page host shall directly access real-time data from the BACnet network. Data shall be displayed in real time and update automatically without user interaction. User shall be able to change data on displays if logged in with the appropriate user name and password.

C. Communications

1. Web-page host shall include two Ethernet network connections. One network connection shall be dedicated to BACnet network and shall be used to gather real-time data from all the BACnet devices that form the BACnet System. This network shall communicate via BACnet, allowing the Web-page host to gather data directly from units on the local LAN or from other projects connected over a WAN. This network shall also provide the connection to the BACnet server for Web page generation.

2. The second Ethernet connection shall provide the physical connection to the Internet or an IP-based WAN. It shall be the port that is used for the browser to

receive Web pages and data from the Web-page host. The Web-page host shall act as a physical barrier between the BACnet network and the WAN or Internet connection that allows the browser to receive web pages and data. The two separate network connections provide for a physical barrier to prevent raw BACnet traffic being exposed on the IP network.

3. The Web-page host shall provide for complete isolation of the IP and BACnet networks by not routing networking packets between the two networks.
4. BACnet Ethernet network shall be provided and installed by the BACnet System supplier. Owner shall provide and incur any monthly charges of WAN/Internet connection.

D. Display of Data

1. Web page graphics shown on browser shall be replicas of the BACnet System displays. User shall need no additional training to understand information presented on Web pages when compared to what is shown on BACnet System displays. Web page displays shall include animation just as BACnet System displays. Fans shall turn, pilot lights shall blink, and coils shall change colors, and so on.
2. Real-time data shall be shown on all browser Web pages. This data must be directly gathered via the BACnet network and automatically updated on browser Web page displays without any user action. Data on the browser shall automatically refresh as changes are detected without re-drawing the complete display.
3. It shall be possible for user from browser Web page to change data if the user is logged on with the appropriate password. Clicking on a button or typing in a new value shall change digital data. Using pull-down menus or typing in a new value shall change analog data.
4. Data displays shall be navigated using pushbuttons on the displays that are simply clicked on with the mouse to select a new display. Alternatively, the standard back and forward buttons of the browser can be used for display navigation.

E. Time Schedule Adjustment

1. Web access shall allow user to view and edit all schedules in the system. This includes standard, holiday and event schedules as described in BACnet System specification. Display of schedules shall show interaction of all schedules on a single display so user sees an overview of how all work together. User shall be able to edit schedules from this display.
2. Display of all 3 schedules must show all ON times for standard, holiday and event schedules in different colors on a given day. In addition, OFF times for each must also be shown in additional colors. User shall be able to select from standard calendar what days are to be scheduled and same display shall show all points and zones affected. User shall be able to set time for one day and select all days of the week that shall be affected as a recurrence of that same schedule for that given day.

3. Schedule list shall show all schedules currently defined. This list shall include all standard, holiday and event schedules. In addition, user shall be able to select a list that shows all scheduled points and zones.

F. Logging of Information

1. User shall use standard browser technology to view all trend logs in system. User shall be able to view logged data in tabular form or graphical format. User shall be able to adjust time interval of logged data viewed and shall be able to adjust y axis of data viewed in graphical format. User shall also be able to down-load data through the web interface to local computer. Data shall be in CSV format.

G. Alarm Handling

1. Web interface shall display alarms as they occur. User shall be able to acknowledge alarms using browser technology. In addition, user shall be able to view history of alarm occurrence over a user selected time frame. In addition, those alarms may be filtered for viewing per user selected options. A single selection shall display all alarms that have not been acknowledged.

H. Web Page Generation

1. Web pages shall be generated automatically from the BACnet System displays that reside on the BACnet System server. User shall access Web-page host via the network and shall initiate a web page generation utility that automatically takes the BACnet System displays and turns them into Web pages. The Web pages generated are automatically installed on the Web page host for access via any computer's standard browser.

I. Password Security and Activity Log

1. Access via Web browser shall utilize the same hierarchical security scheme as BACnet System system. User shall be asked to log in once the browser makes connection to Web-page host. Once the user logs in, any and all changes that are made shall be tracked by the BACnet System server. The user shall be able to change only those items that the user has authority to change. A user activity report shall show any and all activity of the users that have logged in to the system regardless of whether those changes were made using a browser or via the BACnet System workstation.

J. BACnet Communication

1. Web server shall directly communicate to all devices on the BACnet System network using BACnet protocol. No intermediate devices shall be necessary for BACnet communication.

2.4 BUILDING CONTROLLER (ACM)

A. General Requirements

1. Building Controller shall be of modular construction such that various modules may be selected to fit the specific requirements of a given project. Modules shall consist of a power supply module, a BACnet Ethernet-MS/TP module, a BACnet MS/TP only module and a modem module for telephone communication as a

minimum. Those projects that require special interfaces may use Modbus modules as needed. However, all Ethernet communications and all controllers including central plant controllers, advanced application controllers and unitary controllers supplied by BMS manufacturer shall utilize the BACnet protocol standard.

2. Modules shall be selected to fit the particular project application. Up to 7 modules shall be powered by a single power supply module. All modules shall be panel mounted on DIN rail for ease of addition and shall be interconnected via simple plug in cable. A module in the middle shall be replacable without removing any other modules.
3. All modules shall be capable of providing global control strategies for the system based on information from any objects in the system regardless if the object is directly monitored by the building controller module or by another controller. The software program implementing these strategies shall be completely flexible and user definable. All software tools necessary for programming shall be provided as part of project software. Any systems utilizing factory pre-programmed global strategies that cannot be modified by field personnel on-site, via a wide area network or downloaded via remote communications are not acceptable. Changing global strategies via firmware changes is also unacceptable.
4. Programming shall be object-oriented using control function blocks, supporting DDC functions, 1000 Analog Values and 1000 Binary Values. All flowcharts shall be generated and automatically downloaded to controller. Programming tool shall be supplied and be resident on workstation. The same tool shall be used for all controllers.
5. Provide means to graphically view inputs and outputs to each program block in real-time as program is executing. This function may be performed via the operator's workstation or field computer.
6. Controller shall have a memory needed to ensure high performance and data reliability. Battery shall provide power for orderly shutdown of controller and storage of data in nonvolatile flash memory. Battery back up shall maintain real-time clock functions for a minimum of 20 days.
7. Global control algorithms and automated control functions shall execute via 32-bit processor.
8. Schedules
    a. Each building controller module shall support a minimum of 80 BACnet Schedule Objects and 80 BACnet Calendar Objects.
    b. Building controller modules shall provide normal 7 day scheduling, holiday scheduling and event scheduling.
9. Logging Capabilities
    a. Each building controller shall log as minimum 320 values. Any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.
    b. Logs may be viewed both on-site or off-site via WAN or remote communication.

c. Building controller shall periodically upload trended data to networked operator's workstation for long term archiving if desired.

d. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.

10. Alarm Generation

a. Alarms may be generated within the system for any object change of value or state either real or calculated. This includes things such as analog object value changes, binary object state changes, and various controller communication failures.

b. Each alarm may be dialed out as noted elsewhere.

c. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site via remote communications.

d. Controller must be able to handle up to 320 alarm setups stored as BACnet event enrollment objects – system destination and actions individually configurable.

11. Demand Limiting

a. Demand limiting of energy shall be built a built in function that shall be user configurable. Each controller module shall support shedding of up to 200 loads using a minimum of two types of shed programs.

b. Load shedding programs in Building Controller Modules shall operate as defined in section 2.1.J of this specification.

12. Tenant Activity Logging

a. Tenant Activity logging shall be supported by Building Controller Module. Each independent module shall support a minimum of 80 zones.

b. Tenant Activity logging shall functions as defined in section 2.1.K of this specification.

13. Automatic Demand Response (ADR)

a. Software shall have imbedded ADR strategies that the District can employ at any time.

14. Title 24 FDD Economizer Control

a. The controller software shall incorporate a CEC (California Energy Commission) listed and approved FDD economizer control strategy.

B. Ethernet – MS/TP Module

1. Ethernet – MS/TP Module shall support every function as listed under paragraph A, General Requirements, of this section and the following.

2. All communication with operator workstation and all application controllers shall be via BACnet. Building controller Ethernet – MS/TP module shall incorporate as a minimum, the functions of a 2-way BACnet router. Controller shall route BACnet messages between the high-speed LAN (Ethernet 10/100MHz) and master slave token passing (MS/TP) LAN. Ethernet – MS/TP module shall also route messages from all other Building Controller modules onto the BACnet Ethernet network.

a. MS/TP LAN must be software configurable from 9.6 to 76.8Kbps.

b. The RJ-45 Ethernet connection must accept either 10Base-T or 100Base-TX BACnet over twisted pair cable (UTP).

3. BACnet Conformance

a. Ethernet – MS/TP module shall as a minimum support MS/TP and Ethernet BACnet LAN types. It shall communicate directly via these BACnet LANs as a native BACnet device and shall support simultaneous routing functions between all supported LAN types. Global Controller shall be a BACnet conformance class 3 device and support all BACnet services, Functional Groups and all standard BACnet object types

b. The Building Controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN. Must support interoperability on wide area networks (WANs) and campus area networks (CANs) and function as a BACnet Broadcast Management Device (BBMD).

2.5 Visual Logic CONTROLLERS (VLC)

A. Provide one or more native BACnet application controllers for each air handler and or Fan coil unit. All controllers shall interface to building controller via MS/TP LAN using BACnet protocol. No gateways shall be used. Controllers shall include input, output and self-contained logic program as needed for complete control of units. Controllers shall be fully programmable using graphical programming blocks. Programming tool shall be resident on operator workstation and be the same tool as used for the building controller. No auxiliary or non-BACnet controllers shall be used.

B. BACnet Conformance

1. Application controllers shall as a minimum support MS/TP BACnet LAN types. They shall communicate directly via this BACnet LAN at 9.6, 19.2, 38.4 and 76.8 Kbps, as native BACnet devices. Application controllers shall be of BACnet conformance class 3 and support all BACnet services necessary such as Files Functional Group, Reinitialize Functional Group and Device Communications Functional Group.

2. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

3. Standard BACnet object types supported shall include as a minimum—Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Device, File, and Program object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. Application controllers shall include universal inputs with 10-bit resolution that accept 3K and 10K thermistors, 0–10VDC, 0–5 VDC, 4–20 mA and dry contact signals. Any input on a controller may be either analog or digital with a minimum of 3 inputs that accept pulses. Controller shall also include support and modifiable programming for interface to intelligent room sensor with digital display. Controller shall include binary and analog outputs on board. Analog outputs shall be switch selectable as either 0–10VDC or 0–20mA. Software shall include scaling features for analog outputs. Application controller shall include 24VDC voltage supply for use as power supply to external sensors.

D. All program sequences shall be stored on board application controller in EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller 10 times per second and capable of multiple PID loops for control of multiple devices. All calculations shall be completed using floating-point math and system shall support display of all information in floating-point nomenclature at operator's terminal. Programming of application controller shall be completely modifiable in the field over installed BACnet LANs or remotely via modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Application controller shall be programmed using programming tools as described in operator's terminal section.

E. Application controller shall include support for intelligent room sensor. Display on intelligent room sensor shall be programmable at application controller and include an operating mode and a field service mode. All button functions and display data shall be programmable to show specific controller data in each mode based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.

2.6 APPLICATION SPECIFIC VLC CONTROLLERS (HP's, AC's, FC's)

A. Provide one native BACnet application controller for each piece of unitary mechanical equipment that adequately covers all objects listed in object list for unit. All controllers shall interface to building controller via MS/TP LAN using BACnet protocol. No gateways shall be used. Controllers shall include input, output and self-contained logic program as needed for complete control of unit.

B. BACnet Conformance

1. Application controllers shall as a minimum support MS/TP BACnet LAN types. They shall communicate directly via this BACnet LAN at 9.6, 19.2, 38.4 and 76.8 Kbps, as native BACnet devices. Application controllers shall be of BACnet conformance class 3 and support all BACnet services necessary such as Files Functional Group, Reinitialize Functional Group and Device Communications Functional Group.

2. Please refer to section 22.2, BACnet Functional Groups in the BACnet standard for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

3. Standard BACnet object types supported shall include as a minimum–Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Device, File and Program Object Types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. Application controllers shall include universal inputs with 10-bit resolution that can accept 3K and 10K thermistors, 0–5 VDC, 4–20 mA, dry contact signals and a minimum of 3 pulse inputs. Any input on controller may be either analog or digital. Controller shall also include support and modifiable programming for interface to intelligent room sensor. Controller shall include binary outputs on board with analog outputs as needed.

D. All program sequences shall be stored on board controller in EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller 10 times per second and shall be capable of multiple PID loops for control of multiple devices. Programming of application controller shall be completely modifiable in the field over installed BACnet LANs or remotely via modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Application controller shall be programmed using same programming tools as building controller and as described in operator workstation section. All programming tools shall be provided and installed as part of system.

E. Application controller shall include support for intelligent room sensor. Display on room sensor shall be programmable at controller and include an operating mode and a field service mode. All button functions and display data shall be programmable to show specific controller data in each mode based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.

2.7 SENSORS and MISCELLANEOUS DEVICES

A. Temperature Sensors

1. All temperature sensors to be solid state electronic, factory-calibrated to within 0.5°F, totally interchangeable with housing appropriate for application. Wall sensors to be installed as indicated on drawings. Mount 48 inches about finished floor. Duct sensors to be installed such that the sensing element is in the main air stream. Immersion sensors to be installed in wells provided by control contractor, but installed by mechanical contractor. Immersion wells shall be filled with thermal compound before installation of immersion sensors. Outside air sensors shall be installed away from exhaust or relief vents, not in an outside air intake and in a location that is in the shade most of the day.

B. Intelligent Room Sensor with LCD Readout – Microset 4 (Temperature, Humidity)

1. Sensor shall contain a backlit LCD digital display and user function keys along with temperature sensor. Controller shall function as room control unit, and shall allow occupant to raise and lower setpoint, and activate terminal unit for override use—all within limits as programmed by building operator. Sensor shall also

allow service technician access to hidden functions as described in sequence of operation.

2. The Intelligent Room Sensor shall simultaneously display room setpoint, room temperature, outside temperature, and fan status (if applicable) at each controller. This unit shall be programmable, allowing site developers the flexibility to configure the display to match their application. The site developer should be able to program the unit to display time-of-day, room humidity and outdoor humidity. Unit must have the capability to show temperatures in Fahrenheit or Centigrade.
3. Override time may be set and viewed in half-hour increments. Override time count down shall be automatic, but may be reset to zero by occupant from the sensor. Time remaining shall be displayed. Display shall show the word “OFF” in unoccupied mode unless a function button is pressed.
4. See sequence of operation for specific operation of LCD displays and function keys in field service mode and in normal occupant mode. Provide intelligent room sensors as specified in point list.
5. Space sensor shall have a soft light glow beneath the space sensor that glows Blue when the AC unit is in cooling, ORANGE when in heating and RED if the FDD economizer controls detect a fault.

C. Microtouch Wall Sensor (If shown on drawings)

1. Standard wall sensor shall use solid-state sensor identical to intelligent room sensor and shall be packaged in aesthetically pleasing enclosure. Sensor shall provide override function, warmer/cooler lever for set point adjustment and port for plug-in of Field Service Tool for field adjustments. Override time shall be stored in controller and be adjustable on a zone-by-zone basis. Adjustment range for warmer/cooler lever shall also be stored in EEPROM on controller. All programmable variables shall be available to Field Service Tool through wall sensor port.

D. Blank Stainless Steel Wall Sensor (If shown on drawings)

1. Blank stainless steel room sensor shall use solid-state sensor identical to intelligent room sensor.
2. Dorm room AC units shall have return air temperature sensors installed in the chase behind the return air grills of the dorm rooms.

PART 3 - EXECUTION

3.1 GENERAL

A. All electric wiring and all installation work including piping of control systems and internal wiring of panelboards for temperature control and indicating systems shall be done by an authorized representative of the controls manufacturer whose primary business is the installation and maintenance of temperature control and indicating systems. Wiring shall conform to National Electric Code.

B. Identify each item of control equipment with stamped tape firmly attached to equipment and each panel with nameplate of 1/16 inch laminated plastic with black background and white letters 1/4 inch high.

C. Control system shall be connected to the existing systems. All control adjustments shall be accessible without use of ladder.

D. Thermostats on outside walls shall be mounted on 1 inch rigid fiberglass insulating base.

E. Drawings:

1. Drawings are diagrammatic only, provide all material and labor required to make the system operate to the complete satisfaction of the Architect at no additional cost to the Owner.
2. Submit to the Architect for approval seven copies of shop drawings of the entire control system before starting work.
3. Upon completion of the work, provide diagrams of the control systems including a detailed description of the operation of the system and each component and post in the mechanical room, or as directed in a permanent frame with 1/8 inch clear plastic cover.

F. There shall be no power wiring in excess of 40 VAC peak voltages run in conduit with communications trunk wiring. In cases where power or signal wiring is run in conduit with trunk wiring, all communication trunk wiring and power wiring shall be run using separate twisted shielded pairs (24 awg) with the shields grounded in accordance with the manufacturers wiring practices.

3.2 INSTALLATION

A. All temperature control and control interlock wiring shall be installed in EMT conduit per local code unless otherwise noted on the plans. Open Plenum wire may be used above accessible ceiling.

B. Wiring shall conform to the California Electrical Code.

C. The installation and supervision of this project shall be carried out by factory-trained personnel who are employed by the Contractor and licensed for this type of work.

D. Install in accordance with manufacturer's instructions.

E. Provide all miscellaneous devices, hardware, software, interconnections installation and programming required to insure a complete operating system in accordance with the sequences of operation and point schedules.

F. All wiring of any nature in connection with the Direct Digital Control and Temperature Control System, regardless of voltage, including temperature control wiring, interlocking branch circuits from power panels, line voltage to EMS devices and low voltage wiring unless shown or specified in Division 26 documents shall be included in this section.

3.3 OPERATOR INSTRUCTION (Training)

A. During system commissioning and at such time acceptable performance of the control system hardware and software has been established; provide 16 hours of operator instruction to the Owner’s operating personnel. Operator instruction during normal working hours shall be performed by a competent representative familiar with systems hardware, software and accessories.

B. At a time mutually agreed upon during system commissioning, as stated above, provide 16 hours of instruction to the Owner’s designated personnel on the operation of the EMS and Temperature Control Systems and describe its intended use with respect to the programmed functions specified. Operator orientation of the EMS shall include, but not be limited to, the overall operation of the program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories, and appropriate operator intervention required in responding to the system's operation.

END OF SECTION

SECTION 23 80 00

HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof mounted air conditioning units.
2. Heating and ventilating units.
3. Split system heat pump units.
4. Split system air conditioning units.
5. High efficiency furnace units.
6. Air cooled condensing units.
7. Cooling coils.
8. Refrigerant piping and fittings.
9. Fans.
10. Kitchen exhaust hood – type 1.
11. Kitchen exhaust hood – type 2.
12. Relief and intake vents.
13. Louvers.
14. Air inlets and outlets.
15. Filters.
16. Dampers.
17. Ductwork.
18. Expansion loops.
19. Insulation.
20. Thermal hanger shield inserts.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 23 00 50, Basic HVAC Materials and Methods.

C. Section 23 05 93, Testing, Adjusting, and Balancing for HVAC.

D. Section 23 09 23, Direct Digital Control (DDC) System for HVAC.

1.3 ACTION SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, dimensions, weight, corner or mounting point weights, furnished specialties and accessories; and installation and start-up instructions. Product data shall include applicable product listings and standards. Refer to Section 23 00 50, Basic HVAC Material and Methods for additional requirements.

1. Upon approval of submittal, provide manufacturer’s installation and operating instructions to the Project inspector for the following:

a. Fire dampers, smoke dampers, and combination smoke-fire dampers.
b. Type 1 kitchen exhaust field applied grease duct enclosures.

C. Engineering Data: Submit fan curves and sound power level data for each fan unit. Data shall be at the scheduled capacity. Data shall include the name of the rating agency or independent laboratory.

1.4 INFORMATIONAL SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. Roof Curb Data: For roof mounted equipment where combined weight of equipment unit and roof curb or rail exceeds 400 pounds, submit calculations from manufacturer for roof curbs proving compliance with the seismic requirements of the California Building Code, and ASCE 7-10. Manufacturer shall certify that roof curbs are suitable for use indicated on Drawings and in Specifications for the seismic design category indicated in structural Contract Documents. Calculations shall be stamped and signed by a State of California registered structural engineer.

C. Economizer Fault Detection and Diagnostics (FDD) System Data: For all air-cooled unitary direct-expansion units equipped with an economizer, provide data for third-party supplied California Energy Commission certified FDD controller, documenting compliance with the requirements of California Building Energy Efficiency Standards. Provide evidence of certification.

D. Record of pre-installation meeting.

E.

F. Coordinated Layouts: Submit coordinated layouts. For requirements refer to article, Coordinated Layouts, in this Section.

1.5 CLOSEOUT SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. Maintenance Data: Submit maintenance data and parts list for each piece of equipment, control, and accessory; including "trouble-shooting guide," in Operation and Maintenance Manual.

C. Record Drawings: Submit Record Drawings of installed ductwork, duct accessories, and outlets and inlets in accordance with requirements of Division 01.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set(s) for each belt-driven unit.
2. Provide one complete set(s) of filters for each filter bank.

1.7 COORDINATED LAYOUT

A. Coordinated layouts are required to amplify, expand and coordinate the information contained in the Contract Documents.

B. Provide minimum 1/4 inch equals one foot scaled coordinated layout drawings showing plan and pertinent section or elevation views of piping, ductwork, equipment, accessories, and electrical systems. Drawings shall be reproducible and work of each trade represented shall be fully coordinated with structure, other disciplines, and finished surfaces. Drawings shall be presented on a single size sheet. Coordinated layout drawings shall have title block, key plan, north arrow and sufficient grid lines to provide cross-reference to design Drawings.

1. Provide a stamp or title block on each drawing with locations for signatures from all contractors involved, including but not limited to the General, HVAC, Plumbing, Fire Protection, and Electrical contractors. Include statement for signature that the contractor has reviewed the coordinated layout drawings in detail and has coordinated the work of his trade.
2. Show on drawings the intended elevation of all ductwork in accordance with the following example:

   B.O.D. = 9'-0"
   OFFSET UP 6"
   B.O.D. = 9'-6"

3. Highlight, encircle or otherwise indicate deviations from the Contract Documents on the coordinated layouts. Architect will not be responsible for identifying deviations from the original Contract Documents.

C. Since scale of contract drawings is small and all offsets and fittings are not shown, Contractor shall make allowances in bid for additional coordination time, detailing, fittings, offsets, hangers and the like to achieve a fully coordinated installation. If changes in duct size are required, equivalent area shall be maintained and the aspect ratio shall

not be in excess of 2 to 1 unless approved by the engineer. Drawings shall be submitted for review prior to fabrication and installation. Drawings may be submitted in packages representing at least one quarter of the building ductwork.

D. Check routing on all ductwork before fabricating. Report any discrepancies to Architect. No extra cost will be allowed for failure to conform to above.

1.8 QUALITY ASSURANCE

A. Design Criteria:

1. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture. All gas-fired equipment shall be UL, ETL or CSA listed.
2. Supply all equipment and accessories in accordance with requirements of applicable national, state and local codes.
3. All items of a given type shall be products of the same manufacturer.
4. Scheduled equipment performance is minimum capacity required.
5. Scheduled electrical capacity shall be considered as maximum available.
6. Scheduled gas BTU input shall be considered as maximum available.

1.9 FIELD CONDITIONS

A. Interruption of Existing Services: Do not interrupt services to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of services.
2. Do not interrupt services without Architect's written permission.

1.10 WARRANTY

1. Air Conditioning Unit, Roof-Mounted:

    a. Compressor shall have a five-year warranty.
    b. Stainless steel heat exchanger shall have a fifteen-year warranty.
2. Heating and Ventilating Unit: Heat exchanger shall have minimum 10-year warranty.
3. High Efficiency Furnace Unit:

    a. Heat exchangers shall have a 20-year warranty.
    b. Entire unit shall have a 5-year warranty.

4. Air Cooled Condensing Unit: Unit shall have 5-year limited compressor warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

2.2 GAS FIRED EQUIPMENT

A. All gas-fired equipment shall be listed for use as a gas appliance.

B. All units shall comply with the emissions requirements of the Air Quality Management District (AQMD) in which they are to be installed.

2.3 AIR CONDITIONING UNIT, ROOF-MOUNTED

A. Provide factory assembled single packaged outdoor rooftop mounted, electrically controlled gas heating and electric cooling unit, rated in accordance with ARI Standards 210/240 or 340/360, and ETL or UL listed and labeled, classified in accordance with UL 1995. Provide refrigerant charge R-410A, all internal wiring, piping, controls, and special features required prior to field startup. Design unit to conform to the following:

1. California NOx emission requirements.
2. ASHRAE 15.
3. ASHRAE 90.1.
4. Insulation, adhesive, and all materials exposed to air stream shall meet NFPA 90A requirements for flame spread and smoke generation.
5. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).

B. Unit shall be rated in accordance with ARI sound standards 270 or 370.

C. Unit shall be ETL or UL tested and certified in accordance with ANSI Z21.47 Standards as a total package.

D. Roof curb shall be designed to conform to NRCA Standards.

E. Unit shall be designed and manufactured in accordance with ISO 9001.

F. For unit sizes applicable to Energy Star program, units shall be Energy Star qualified.

G. Cabinet:

1. Provide galvanized steel unit cabinet, bonderized and coated with a baked enamel finish.

2. All airstream interior surfaces shall be insulated with a minimum 1/2 inch thick, 1.5 lb density cleanable insulation. Insulation shall be encapsulated with panel design or have sealed edges.
3. Cabinet panels shall be hinged with integrated non-corrosive hinges. Provide hinged access panels for the filter, compressors, evaporator fan, and control box/ heat section areas. Each panel shall have multiple latches and handles. Each external hinged access panel shall be permanently attached to the rooftop unit.
4. Return air filters shall be accessible through a dedicated hinged access panel.
5. Fork lift slots and rigging holes shall be provided in unit base rails. Base rails shall be minimum 16 gauge.
6. Unit shall have an integral sloped condensate drain pan, providing minimum 3/4 in.-14 NPT connections for horizontal drain configuration. Provide unit with alternate vertical thru-the-bottom drain connection when furnished as standard for units sizes scheduled on Drawings. See Drawings for drain configuration. Pan shall be removable for cleaning and maintenance. All drain pans shall conform to ASHRAE 62.1 self-draining provisions.
7. Unit shall have standard side and alternate field or factory installed thru-the-bottom power and control wiring connection capability. Thru-the-bottom electrical connections shall use manufacturer's approved water-tight connection method.
8. Unit shall be field convertible to, or factory furnished with, horizontal air discharge, as applicable for unit sizes as scheduled on Drawings.

H. Fans:

1. Centrifugal supply air blower (evaporator fan) shall have sealed, permanently lubricated ball bearings, or rigid pillow block bearings, as supplied as standard equipment for unit sizes scheduled on Drawings. Units supplied with pillow block bearings shall be furnished with accessible lubricant fittings. Provide belt-driven double inlet fan wheel, centrifugal type with forward curved blades and adjustable sheaves. Multiple speed direct drive motors may be utilized when supplied as standard equipment for efficiency and electrical requirements as scheduled on the Drawings. Fan wheel shall be steel, with corrosion resistant finish, dynamically balanced.
2. Condenser fans shall be of the direct-driven propeller type, with corrosion-resistant aluminum blades. Fans shall be dynamically balanced and discharge air upwards. Induced-draft blower shall be of the direct-driven, single inlet, forward-curved, centrifugal type, made from aluminized steel with a corrosion-resistant finish and shall be dynamically balanced.
3. Induced draft fan shall be of the direct driven, single inlet, forward-curved centrifugal type. Fan wheel shall be steel, with corrosion resistant finish, dynamically balanced.

I. Motors:

1. Compressor motors shall be cooled by refrigerant gas passing through motor windings and shall have line break thermal and current overload protection.
2. Evaporator fan motor shall have permanently lubricated, sealed bearings and inherent automatic-reset thermal overload protection or manual reset calibrated circuit breakers.

3. Totally enclosed condenser-fan motor shall have permanently lubricated, sealed bearings, and inherent automatic-reset thermal overload protection.
4. Induced-draft motor shall have permanently lubricated sealed bearings and inherent automatic-reset thermal overload protection.
5. For single-phase fan motors sized larger than 1/12 hp and smaller than 1 hp, refer to Article, Electric Motors, in Section 23 00 50, Basic HVAC Materials and Methods.

J. Compressor:

1. Fully hermetic, scroll type with internal high-pressure and temperature protection.
2. Factory installed rubber shock mounted and internally spring mounted for vibration isolation.
3. Compressor Anti-Recycle Timer: Compressor shall be prevented from restarting for a minimum of five minutes after shutdown, with manufacturers installed compressor cycle delay.

K. Coils:

1. Standard evaporator and condenser coils shall have aluminum plate fins mechanically bonded to seamless internally finned copper tubes with all joints brazed.
2. Units shall have face-split type evaporator coils.
3. For units with single compressor, condenser coils shall be single slab, single pass design. For dual compressor units, condenser coils shall be single slab, 2 pass design.
4. Evaporator coils shall be leak tested at minimum 150 psig, and pressure tested at minimum 450 psig.
5. Condenser coils shall be leak tested at minimum 150 psig, and pressure tested at minimum 650 psig.

L. Heating Section:

1. Induced-draft combustion type with direct-spark ignition system and redundant main gas valve with 2-stage capability on all 3-phase units.
2. Heat Exchanger:
   a. The optional stainless steel heat exchanger shall be of the tubular-section type, constructed of minimum 20-gage, type 409 stainless steel, including stainless steel tubes, vestibule plate, and collector box.
3. Burners shall be of the in-shot type constructed of aluminum-coated steel.
4. All gas piping shall enter the unit at a single location. Gas entry shall be through side or bottom of unit. See Drawings for gas entry location. When bottom gas entry is utilized, unit shall be furnished with field installed conversion kit, arranged so that gas shut-off valve is accessible from the roof.
5. All factory-installed orifices are for operation up to 2,000 feet of altitude. For altitudes between 2,000 feet and 7,000 feet, a factory certified kit shall be furnished for field installation.
6. Units shall be suitable for use with natural gas or propane. Provide field-installed propane conversion kit as required, see schedule on Drawings.

7. The integrated gas controller board shall include gas heat operation fault notification using an LED (light-emitting diode).
8. Unit shall be equipped with anti-cycle protection with one short cycle on unit flame rollout switch or 4 continuous short cycles on the high-temperature limit switch. Fault indication shall be made using an LED.
9. The integrated gas controller board shall contain algorithms that modify evaporator-fan operation to prevent future cycling on high-temperature limit switch.
10. The LED shall be visible without removal of control box access panel.
11. Gas burner tray shall be removable for maintenance.
12. Heating section shall be insulated with foil-faced fiberglass insulation.

M. Refrigerant Components:

1. Each refrigerant circuit shall include:

   a. Balanced port thermostatic expansion valve (TXV) with removable power element.
   b. Solid core refrigerant filter driers with pressure ports.
   c. Refrigerant pressure gage ports and connections on suction, discharge, and liquid lines.

N. Filter Section:

1. Standard filter section shall accommodate 2 inch deep filters. Filters shall conform to the “Air Filters” Article in this Specification Section.
2. Filter section shall use standard size filters.

O. Controls:

1. Unit shall be complete with self-contained low voltage fuse protected control circuit. Refer to Section 25 50 00, if included, and equipment schedule, sequence of operation and control diagram on Drawings for additional requirements.
2. When third party direct digital controls with an Energy Management System will be utilized, provide electro-mechanical controls with 24V thermostat interface.
3. When stand-alone thermostat operation is utilized, provide electro-mechanical controls with 24V thermostat interface or provide microprocessor controls.
4. When stand-alone thermostat operation is utilized for single-zone VAV units, provide microprocessor controls. Units shall have factory mounted supply fan variable frequency drives.
5. When third party direct digital controls with an Energy Management System will be utilized for single zone VAV units, provide microprocessor controls with BACnet or LON interface. Units shall have factory mounted supply fan variable frequency drives.
6. Electro-mechanical controls shall include the following, as a minimum:

   a. Service run test capability.
   b. Provide compressor minimum run time (3 minutes) and minimum off time (5 minutes).
   c. Economizer control.
   d. Unit shall have 35° F low ambient cooling operation.

e. Time delay relay.

7. Microprocessor controls shall include the following, as a minimum:

a. User diagnostic interface.
b. Unit control with standard suction pressure transducers and condensing temperature thermistors.
c. Shall provide a 5° F temperature difference between cooling and heating set points to meet ASHRAE 90.1 energy standard.
d. Service run test capability.
e. Shall accept input from a CO2 sensor (indoor).
f. Configurable alarm light shall be provided which activates when certain types of alarms occur.
g. Provide compressor minimum run time (3 minutes) and minimum off time (5 minutes).
h. Service diagnostic mode.
i. Economizer control.
j. Unit shall have 0° F low ambient cooling operation.
k. Time delay relay.

P. Safeties:

1. Unit shall incorporate a solid-state compressor lockout that provides optional reset capability at the space thermostat, should any of the following safety devices trip and shut off compressor:

a. Compressor lockout protection provided for either internal or external overload.
b. Low-pressure protection.
c. Freeze protection (evaporator coil).
d. High-pressure protection (high pressure switch or internal).
e. Compressor reverse rotation protection.
f. Loss of charge protection.
g. Start assist on singe-phase units.

2. Supply-air sensor shall be located in the unit and detect both heating and cooling operation.
3. Induced draft heating section shall be provided with the following minimum protections:

a. High-temperature limit switch.
b. Induced-draft motor speed sensor.
c. Flame rollout switch.
d. Flame proving controls.
e. Redundant gas valve.

4. Phase Protection: Provide unit-mounted “SymCom,” or equal, Motor Saver three phase voltage monitor, model 201A or equal, adjustable voltage range for each unit, install per manufacturer's recommendations, mount in NEMA 3R enclosure if exposed to the weather.

a. Units shall provide the following features:

1) Low voltage fault trip and reset.
2) Voltage unbalance/phasing fault trip and reset.
3) High voltage fault trip and reset.
4) Transient Protection (Internal).
5) Automatic restart.

b. Provide each unit with 600V socket, “SymCom” model OT08, or equal.

Q. Operating Characteristics:

1. Unit shall be capable of starting and running at 125° F ambient outdoor temperature per maximum load criteria of ARI Standards 210 or 360.
2. Unit will operate in cooling down to an outdoor ambient temperature of 35° F.
3. Unit shall be provided with fan time delay to prevent cold air delivery in heating mode.

R. Electrical Requirements:

1. All unit power wiring shall enter unit cabinet at a single location. Both unit side and bottom power entry provisions shall be provided. Refer to Drawings schedule for thru-the-bottom power wiring requirement.

S. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Carrier Corporation.
2. Trane Inc.
3. Johnson Controls, Inc.

T. Provide the following additional features and equipment:

1. Roof Curb: Formed galvanized steel with wood nailer strip capable of supporting entire unit weight. Provide 3 inch wide bottom flange.
2. Provide heavy-duty 18 gauge expanded metal coil guard grille to protect all surfaces of the condensing coil. Coil guard by Micrometl, Canfab, or equal.
3. Modulating Power Exhaust Economizer: Micrometl, Canfab, or equal. Integrated type capable of simultaneous economizer and compressor operation.

a. Provide self-contained outdoor rooftop system, mounted directly to the return air compartment of the HVAC packaged equipment. Provide differential dry bulb economizer control system and a factory programmed, fully programmable variable frequency drive package controlled by a differential pressure transmitter, mounted directly to the return air compartment of the HVAC packaged equipment. Design the system to continuously maintain space pressure, and provide capability of introducing up to 100 percent outdoor air.

1) Economizer control system shall be certified as meeting the requirements for Fault Detection and Diagnostics (FDD) in the California Building Energy and Efficiency Standards.

b. Provide outside differential pressure tubing termination with hex style pneumatic filter-muffler, minimum filtration 40 microns, 53 SCFM maximum at 100 psi, as manufactured by McMaster-Carr, or equal.
c. Provide hinged cabinet access doors and include latches to provide a tool-less entry for servicing.
d. Provide door lock on the power exhaust cabinet to meet ETL safety requirements.
e. Outdoor air intake dampers shall be low leak not to exceed 3 percent at 1 inch wg pressure differential and include stainless steel side seal and neoprene edge seal. Arrange dampers to close upon loss of power.
f. Provide belt driven exhaust blowers, double inlet, forward-curved centrifugal type. Provide gravity backdraft damper at fan outlet.
g. Provide fully programmable factory programmed variable frequency drive (VFD) package for each fan, driven by 4 to 20 mA signal from a differential pressure transmitter. Pressure transmitters shall measure 0 - 0.1 in wg. Install room sensor tubing with sensor tube termination installed within the room.

1) Where direct digital controls are utilized, provide Belimo, or equal, damper actuator, complete with spring return and all controls required to make the system fully operational.
2) Where stand-alone controls are utilized, provide Belimo, or equal, damper actuator, complete with spring return and all controls, including logic module, required to make the system fully operational.

4. Other features, accessories, and equipment scheduled on Drawings.

U. Replenish for a period of one year without cost to the Owner all refrigerant and oil required to maintain the proper levels.

V. Owner Training: Manufacturer shall provide two initial on-site 4-hour training sessions for Owners' maintenance personnel. Manufacturer shall provide one 4-hour follow-up training session to be scheduled by Owner within one year of the date of the final initial training session. Training session agenda shall be as follows:

1. First session: Equipment.
2. Second session: Controls.
3. Follow-up session: Agenda by Owner.

2.4 HEATING AND VENTILATING UNIT

A. Provide factory assembled packaged rooftop mounted, electrically controlled heating and make-up air unit, ETL or UL listed and labeled, consisting of cabinet, supply fan, filters, and indirect-fired gas furnace. Provide all internal wiring, piping, controls and special features required prior to field startup. Design unit to conform to the following:

1. ANSI Z83.8/CSA 2.6.
2. NFPA 54.
3. ASHRAE 90.1.
4. Insulation, adhesive, and all materials exposed to airstream shall meet NFPA 90A requirements for flame spread and smoke generation.
5. Unit casing shall be capable of withstanding 1000-hour salt spray exposure per ASTM B117 (scribed specimen).
6. Roof curb shall be designed to conform to NRCA Standards.

B. Cabinet: Double-wall G90 galvanized steel panels, minimum 18 gauge, rigidly formed and supported by minimum 16 gauge galvanized steel channel base with rigging holes. Cabinet shall be fully weatherized for outdoor installation, and provided with the following:

1. Finish: Air-dried enamel.
2. Cabinet insulation: Minimum 1" thick fiberglass duct liner, complying with ASTM C 1071, Type II, applied on all unit sections.
3. Access Panels: Hinged, double-wall with cam-lock fasteners. Insulate access panels exposed to airstream equal to unit cabinet insulation. Provide access panels at furnace, fan motor, filter and control areas.
4. Provide with integral curb cap and matching roof curb. Roof curb shall be formed galvanized steel with wood nailer strip, capable of supporting entire unit weight. Provide 3 inch wide bottom flange.

C. Blower: Double width, double inlet centrifugal type fan, statically and dynamically balanced. Blower motor shall be single speed, open drip proof, and energy efficient. Motor bearings shall be permanently lubricated ball bearing or pillow block type. Blower and motor shall be vibration isolated.

1. For single-phase fan motors sized larger than 1/12 hp and smaller than 1 hp, refer to Article, Electric Motors, in Section 23 00 50, Basic HVAC Materials and Methods.
2. Drive: V-belt drive with matching fan pulley and adjustable motor sheaves and belt assembly. Linked blower belts will not be accepted.

D. Heating Section: CSA certified for use with natural gas, 80 percent minimum thermal efficiency. Heating section may be integral to blower cabinet or be provided as separate section. Provide with the following features:

1. Modulating gas valve, capable of turndown to minimum 25 percent of gas input value scheduled on Drawings.
2. Stainless steel burner assembly.
3. Combustion air vent fan: Direct drive centrifugal type.
4. Electronic discharge temperature controller. Control interface shall be LCD screen with indicating lights. Default display shall be actual discharge temperature.
5. Direct spark ignition with non-standing pilot.
6. 409 Stainless steel tubular heat exchanger.
7. Controls and Safeties: All burner controls factory wired to terminal blocks, complete with 24 V transformer. Provide the following:

a. High temperature limit control with automatic reset.
b. Ignition with 100 percent timed lockout.
c. Pressure switch to lock out gas valve on failure of combustion air blower.
d. Gas Train: Regulated, redundant, 24 V AC gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shut off, and manual shut off.
e. Purge-period timer shall automatically delay burner ignition and bypass low-limit control, and provide pre-purge and post-purge cycle.

E. Filter Section

1. Standard filter section shall accommodate 2 inch deep filters. Filters shall conform to the “Air Filters” Article in this Specification Section.
2. Filter section shall use standard size filters.
3. Velocity shall not exceed 550 FPM.

F. Mixing Box: Inlet air control shall allow for 100 percent OA and 100 percent return air with mixed air controller and warm-up (ASHRAE Cycle III). Standard configuration shall be bottom return with rear outside air intake. Provide galvanized outside air hood with bird screen and rain baffles. Omit outside air hood when evaporative cooling module is utilized. When economizer operation is indicated in the sequence of operations, provide dry bulb economizer controller.

G. Dampers:

1. Outdoor-Air and Return Air Damper: Galvanized steel, opposed-blade dampers with vinyl blade seals and stainless steel jamb seals.
2. Damper Operator: Direct coupled, multi-position electronic type with spring return or fully modulating electronic type as required by control sequence indicated on Drawings.

H. Downturn Plenum: Provide downturn plenum if required for vertical supply air discharge. See Drawings for unit air discharge configuration. Plenum shall be of materials, construction and finish equal to that described for unit cabinet.

I. Controls:

1. Factory-wired, fuse protected control transformer, connection for power supply and field-wired unit to remote control panel. Refer to Section 25 50 00, if included, and equipment schedule, sequence of operation and control diagram on Drawings for additional requirements.
2. When utilizing stand-alone thermostat controls: Manufacturer provided remote surface-mounted or recessed control panel shall contain potentiometer for setting minimum outside air quantity. Refer to Drawings for location and type of control panel. Remote control panel and potentiometer not required for direct digital control. Remote control panel shall have the following additional features:

a. Switches:

1) On-off-auto fan switch.

2) Heat-vent-cool switch.

b. Status lights:

1) Supply fan operation indicating light.
2) Blower on.
3) Heat/main valve on.

c. Thermostat with over-ride.

3. When utilizing direct digital control: Provide factory installed application-specific controller and damper actuators compatible with the direct digital control system. Unit manufacturer shall coordinate with controls contractor to ensure compatibility. Controller shall have the following functions:
   a. Provide start and stop interface relay, and relay to notify DDC system of alarm condition. Provide the following alarms, as a minimum:

      1) Supply fan status.
      2) Heat status.
      3) Freeze alarm.

   b. Provide hardware interface or additional sensors as follows:

      1) Room temperature.
      2) Discharge air temperature.
      3) Furnace operating.
      4) Return air temperature.
      5) Outdoor air temperature.
      6) Heater output (0-100 percent).
      7) Modulating damper output or VFD control (0-100 percent).

J. Evaporative Cooling Module: When scheduled on Drawings, provide evaporative cooling module with pump and water metering system. Evaporative cooling module shall be wired and mounted to the base unit at the factory. Provide the following:

1. Cabinet: 300 series stainless steel with finish equal to that described for unit cabinet. Cabinet may be galvanized steel when internal cooling module is of all stainless steel construction. Cabinet shall include louvered intake and 2 inch aluminum mesh filters.
2. Water reservoir: 300 series stainless steel. Overflow and drain connections in the drain pan bottom to be 1/2 inch diameter pipe or standard hose thread.
3. Pump: Submersible, centrifugal sump pump with inlet strainer, balancing valve located in pump discharge, thermally protected, fan cooled motor with moisture-proof windings.
4. Media: Media shall be 12 inch thick GlasDek by Munters Corporation, or equal, cross-fluted pad material of large fibers bonded together by inorganic, non-crystalline fillers and conforming to UL900, Class 2 rating. Pads will have less than .25 inches water column air pressure drop at 550 fpm face velocity when wet, and develop a saturation efficiency of not less than 90 percent.
5. Water hammer arrestor (furnished by piping contractor).

6. Antifreeze protection kit to lock-out evaporative cooling module and drain supply line at a manually selected outside air temperature.
7. Water Metering System:

    a. Microprocessor-based water metering system: Provide timer, solenoid valve, and water distribution piping to apply the water supply to the media in response to outside air dry bulb and wet bulb temperatures. Remote thermostat shall open water supply valve to maintain dry-bulb temperature in space. Timer shall activate thermostat circuit.

K. Electrical: All unit power wiring shall enter the unit at a single location, standard side or alternate bottom. Single-point connection shall include evaporative cooler module. See unit schedule on Drawings for thru-the-bottom wiring requirement.

L. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include the following, or equal:

1. Greenheck Fan Corporation.
2. Reznor-Thomas & Betts Corporation; Mechanical Products Division.

M. Owner Training: Manufacturer shall provide one initial on-site 4-hour training session for Owners' maintenance personnel. Manufacturer shall provide one 2-hour follow-up training session to be scheduled by Owner within one year of the date of the final initial training session.

2.5 SPLIT SYSTEM HEAT PUMPS

A. General: Furnish and install split system air-to-air heat pump system, with R410A refrigerant, and complete with automatic controls. Equipment shall be shipped factory assembled, wired, tested, and ready for field connections.

B. Quality Assurance:

1. Unit shall be ETL or UL listed and labeled.
2. Unit shall be manufactured in a facility registered to ISO 9001:2000.
3. Unit shall be rated in accordance with ARI standard 210.

C. Delivery, Storage and Handling: Follow manufacturer's recommendations.

D. Heating/Cooling System: The total certified heating/cooling capacity shall not be less than scheduled. The compressor power input shall not exceed that of the unit specified.

E. Indoor Section: Wall mounted, ceiling surface mounted, or ceiling recessed mounted, as indicated on Drawings.

1. Cabinet:

    a. Wall mounted: Molded white high strength plastic.

1) Provide wall mounted unit with factory mounting plate.

b. Ceiling surface mounted: Molded white high strength plastic with provision for outside air duct connection.
c. Ceiling recessed mounted: galvanized steel with provision for outside air duct connection.

2. Fans: Double inlet, forward curved, statically and dynamically balanced.
3. Fan Motor: Direct drive, permanently lubricated, with two or 4 speed operation for unit size scheduled on Drawings.

a. For single-phase fan motors sized larger than 1/12 hp and smaller than 1 hp, refer to Article, Electric Motors, in Section 23 00 50, Basic HVAC Materials and Methods.

4. Air Outlet: With motorized horizontal and vertical vanes.

a. Wall and ceiling surface mounted units: Horizontal vane shall close air outlet upon unit shut-down.

5. Evaporator Coil: Aluminum fins mechanically bonded to copper tubes. Coils shall be pressure leak tested.
6. Insulation: Interior surfaces exposed to the airstream shall be fully insulated.

F. Outdoor Section:

1. Casing: Galvanized steel plate, powder coated with acrylic or polyester.
2. Condenser Fan Grille: ABS plastic.
3. Fan and fan motor: Direct drive, totally enclosed, propeller type, permanently lubricated, horizontal discharge.
4. Compressor: Variable speed rotary type, with crankcase heater and accumulator. Compressor shall be capable of operating at 0 degrees F. Compressor mounted on vibration isolator pads.
5. Coil: Aluminum fins mechanically bonded to copper tubes. Coils shall be pressure leak tested. Provide coil with integral metal guard.

G. Controls: Hard wired, microprocessor based, wall mounted controller with LCD display shall provide the following functions, as a minimum:

1. 7-day programmable timer.
2. Test and check functions.
3. Diagnostic functions.
4. Vane position control.
5. Fan speed adjustment.
6. Temperature adjustment.
7. Automatic restart.
8. Mode selection, including heat/auto/cool/dry/fan.
   a. Provide lockable enclosure for wall mounted controller.

H. Safeties: Shall include the following, as a minimum:

1. Five minute compressor anti-recycle timer.
2. High pressure protection.
3. Current and temperature sensing motor overload protection.

I. Filters: Provide manufacturers washable filters for indoor unit. Provide sufficient filters for four complete changes for each unit.

J. Service Access: All components, wiring, and inspection areas shall be completely accessible through removable panels.

K. Refrigerant Piping:

1. Provide factory pre-charged and sealed line set piping, length to suit the location of equipment. Tubing sizes shall be in accordance with manufacturers written instructions.
2. Provide refrigeration piping in accordance with Article, Refrigerant Piping, in this Section.

L. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Mitsubishi Electric Corporation.
2. Carrier Corporation.
3. Sanyo Electric Co., Ltd.

M. Owner Training: Manufacturer shall provide one on-site 2-hour training session for Owners' maintenance personnel.

2.6 SPLIT SYSTEM AC UNIT

A. General: Furnish and install split system air conditioner, with R410A refrigerant, and complete with automatic controls. Equipment shall be shipped factory assembled, wired, tested, and ready for field connections.

B. Quality Assurance:

1. Unit shall be ETL or UL listed and labeled.
2. Unit shall be manufactured in a facility registered to ISO 9001:2000.
3. Unit shall be rated in accordance with ARI standard 210.

C. Delivery, Storage and Handling: Follow manufacturer's recommendations.

D. Cooling System: The total certified cooling capacity shall not be less than scheduled. The compressor power input shall not exceed that of the unit specified.

E. Indoor Section: Wall mounted, ceiling surface mounted, or ceiling recessed mounted, as indicated on Drawings.

1. Cabinet:

a. Wall mounted: Molded white high strength plastic.

1) Provide wall mounted unit with factory mounting plate.

b. Ceiling surface mounted: Molded white high strength plastic with provision for outside air duct connection.
c. Ceiling recessed mounted: galvanized steel with provision for outside air duct connection.

2. Fans: Double inlet, forward curved, statically and dynamically balanced.
3. Fan Motor: Direct drive, permanently lubricated, with two or 4 speed operation for unit size scheduled on Drawings.
   a. For single-phase fan motors sized larger than 1/12 hp and smaller than 1 hp, refer to Article, Electric Motors, in Section 23 00 50, Basic HVAC Materials and Methods.

4. Air Outlet: With motorized horizontal and vertical vanes.

   a. Wall and ceiling surface mounted units: Horizontal vane shall close air outlet upon unit shut-down.

5. Evaporator Coil: Aluminum fins mechanically bonded to copper tubes. Coils shall be pressure leak tested.
6. Insulation: Interior surfaces exposed to the airstream shall be fully insulated.

F. Outdoor Section:

1. Casing: Galvanized steel plate, powder coated with acrylic or polyester.
2. Condenser Fan Grille: ABS plastic.
3. Fan and fan motor: Direct drive, totally enclosed, propeller type, permanently lubricated, horizontal discharge.
4. Compressor: Variable speed rotary type, with crankcase heater and accumulator. Compressor shall be capable of operating at 0 degrees F. Compressor mounted on vibration isolator pads.
5. Coil: Aluminum fins mechanically bonded to copper tubes. Coils shall be pressure leak tested. Provide coil with integral metal guard.

G. Controls: Hard wired, microprocessor based, wall mounted controller with LCD display shall provide the following functions, as a minimum:

1. 7-day programmable timer.
2. Test and check functions.
3. Diagnostic functions.
4. Vane position control.
5. Fan speed adjustment.
6. Temperature adjustment.
7. Automatic restart.
8. Mode selection, including cool/dry/fan.
   a. Provide lockable enclosure for wall mounted controller.

H. Safeties: Shall include the following, as a minimum:

1. Five minute compressor anti-recycle timer.
2. High pressure protection.
3. Current and temperature sensing motor overload protection.

I. Filters: Provide 1 inch thick fiberglass throwaway filters with cardboard holding frames for indoor unit. Provide sufficient filters for four complete changes for each unit.

J. Service Access: All components, wiring, and inspection areas shall be completely accessible through removable panels.

K. Refrigerant Piping:

1. Provide factory pre-charged and sealed line set piping, length to suit the location of equipment. Tubing sizes shall be in accordance with manufacturers written instructions.
2. Provide refrigeration piping in accordance with Article, Refrigerant Piping, in this Section.

L. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Mitsubishi Electric Corporation.
2. Carrier Corporation.
3. Sanyo Electric Co., Ltd.

M. Owner Training: Manufacturer shall provide one on-site 2-hour training session for Owners' maintenance personnel.

2.7 HIGH EFFICIENCY FURNACE UNIT

A. Provide high efficiency multiple-speed condensing furnace/blower unit for upflow, downflow or horizontal application as indicated on the Drawings. Design unit to conform to the following:

1. California Air Quality Management District emission requirements.
2. ANSI Z 21.47/CSA 2.3 design standard for gas-fired central furnaces.

B. Furnace unit shall have the following certifications:

1. Third party certification by CSA International to current ANSI Z 21.47/CSA 2.3 design standard for gas-fired central furnaces.
2. CSA Blue Star® and Blue Flame® labeled.
3. Efficiency testing per current DOE test procedure as listed in the Federal Register.
4. Federal Trade Commission Energy Guide efficiency labeled.
5. GAMA Consumers' Directory of Certified Efficiency Ratings listed.

C. Unit shall be manufactured in a facility registered to ISO 9001:2000.

D. Cabinet:

1. Pre-painted galvanized steel, minimum .030 inches thickness.
2. Acoustically insulated blower section.
3. Removable bottom closure panel for bottom return air configuration.

E. Fans and Motors:

1. Centrifugal supply air blower shall be constructed of galvanized steel, statically and dynamically balanced.
2. Blower motor shall be direct drive variable speed ECM type, with sealed permanently lubricated ball bearings.
3. Inducer motor shall be direct drive variable speed ECM type, with sealed permanently lubricated ball bearings.

F. Heating Section:

1. Primary heat exchanger shall be 20 gauge corrosion resistant aluminized steel of fold-and-crimp sectional design, with Monoport inshot burners and redundant gas valve.
2. Secondary heat exchanger shall be polypropylene laminated steel of fold-and-crimp design.
3. Heat exchanger section shall be insulated with foil-faced insulation.
4. Line voltage ignitor.
5. Sealed combustion system.

G. Filters:

1. Standard filter section shall accommodate 1 inch deep filters. Filters shall conform to the “Air Filters” Article in this Specification Section.
2. When Drawings indicate contractor-fabricated plenum containing filters, plenum shall accommodate 2 inch deep filters. Filters shall conform to the “Air Filters” Article in this Specification Section.
3. Filter section shall use standard size filters.

H. Controls:

1. Fused microprocessor based control board with diagnostic LED and self-test capability.
2. Unit blower shall operate at continuous speed only, adjust to achieve the airflow scheduled on the Drawings. Other blower speed settings shall be locked out.

I. Safeties:

1. Provide pressure switch for proving flow of flue products and manual reset over-temperature switch.
2. Provide with blower access panel safety interlock switch.

J. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Carrier Corporation.
2. Trane Inc.

K. Provide with mixed air plenum with filter rack and return and outside air dampers, arranged as indicated on Drawings.

1. Where economizer operation is indicated on Drawings, provide differential dry-bulb economizer control system, certified as meeting the requirements for Fault Detection and Diagnostics (FDD) in the California Building Energy and Efficiency Standards.

L. Provide condensate pump, arranged as indicated on Drawings, for removal of condensate from furnace units.

M. Owner Training: Manufacturer shall provide one on-site 1-hour training session for Owners' maintenance personnel.

2.8 AIR COOLED CONDENSING UNIT

A. Provide outdoor-mounted, factory assembled, single piece, air-cooled, split-system air conditioner unit suitable for ground or rooftop installation, rated in accordance with ARI Standard 210, and UL or ETL listed and labeled. Provide refrigerant charge R-410A, all internal wiring, piping, controls, compressor, and special features required prior to field start-up. Design unit to conform to the following:

1. ANSI/ASHRAE latest edition.
2. NEC latest edition.
3. Unit cabinet to be capable of withstanding Federal Test Method Standard No. 141 (Method 6061) 500-hr salt spray test.
4. Unit shall be constructed in accordance with UL standards.

B. Unit shall be certified for capacity and efficiency, and listed in the latest ARI directory.

C. Unit shall be manufactured in a facility registered to ISO 9001:2000.

D. Unit shall be Energy Star Qualified.

E. Provide unit with 5 year limited parts warranty.

F. Cabinet:

1. Unit cabinet constructed of galvanized steel, bonderized, and coated with powder coat paint.

G. Fans:

1. Direct-drive propeller type condenser fan, discharging air vertically.
2. Totally enclosed condenser fan motors, 1-phase type with Class B insulation and permanently lubricated bearings, and corrosion resistant shafts.

3. Condenser fan openings equipped with PVC-coated steel wire safety guards.
4. Statically and dynamically balanced fan blades.

H. Compressor:

1. Hermetically sealed compressor mounted on rubber vibration isolators.
2. Compressor with sound insulator.

I. Refrigeration Components:

1. Refrigerant circuit to include liquid and vapor line shut-off valves with sweat connections.
2. System charge of R-410A refrigerant and compressor oil.
3. Unit to be equipped with factory-supplied high-pressure switch, low pressure switch, and filter drier.
4. Provide unit with manufacturer's refrigerant line set.
5. Provide refrigeration piping in accordance with Article, Refrigerant Piping, in this Section.

J. Condenser Coil:

1. Air-cooled condenser coil constructed of aluminum fins mechanically bonded to copper tubes.
2. Coils shall be leak and pressure tested.

K. Electrical Requirements:

1. Unit shall have single point power connection.
2. Provide unit with 24V control circuit.

L. Operating Characteristics:

1. Unit shall be capable of starting and running a 115 degrees F ambient outdoor temperature per maximum load criteria of ARI Standard 210.
2. Compressor with standard controls shall be capable of operation down to 55 degrees F ambient outdoor temperature.

M. Provide the following additional components and features:

1. Provide evaporator freeze thermostat, winter start control, compressor start assist capacitor and relay, low ambient controller, and ball bearing fan motor.
2. Provide expanded metal coil guard for all sides of the air-cooled condensing unit. Coil guard shall be as manufactured by MicroMetl, Can-Fab, or equal.

N. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Carrier Corporation.
2. Trane Inc.

O. Owner Training: Manufacturer shall provide one on-site 1-hour training sessions for Owners' maintenance personnel.

2.9 COOLING COIL

A. Provide direct expansion encased cooling coil.

1. Install encased coil to operate properly in vertical or horizontal position as required. Construct coil with aluminum plate fins mechanically bonded in non-ferrous tubing with all joints brazed ultrasonically. Coil shall have factory-installed refrigerant metering device, refrigerant line fittings which permit mechanical connections, and condensate pan with primary and auxiliary drain connections.
2. Construct casings of galvanneal steel, bonderize, insulate, and finish with baked enamel.

2.10 REFRIGERATION PIPE AND FITTINGS

A. Refrigeration gas and liquid piping shall be type ACR hard drawn copper tubing, cleaned and capped in accordance with ASTM B280, with wrought copper fittings. All joints shall be brazed with Sil-fos under nitrogen purge. Relief valve discharge piping shall be full size of relief discharge port.

1. Manufactured, pre-charged and pre-insulated refrigerant line-set refrigerant piping may be utilized at Contractor's discretion.

a. VRF Systems: Use of manufactured, pre-charged and pre-insulated refrigerant line-set refrigerant piping between outdoor condensing units and indoor heat recovery controllers, or distribution headers and tees is not allowed. When system manufacturer's installation instructions allow use of refrigerant line-set piping between indoor heat recovery controllers, or distribution headers and tees, and air terminal devices, follow instructions for allowable pipe size range and support to avoid forming traps in the piping.

B. Refrigeration Piping Specialties: Furnish and install Superior, Sporlan, Alco, Henry, or equal, stop valves, solenoid valves, adjustable thermal expansion valves, sight glass, flexible connection, charging valve, and drier with valve bypass in the liquid lines and Superior DFN shell and cartridge suction line filter sized 2-1/2 times tonnage.

1. Install only those refrigeration piping specialties recommended by manufacturer of specific installed equipment.

2.11 REFRIGERANT ACCESS VALVE LOCKING CAPS

A. Each refrigerant circuit access valve located outside buildings, including valves located on roofs, shall be provided with a locking cap. Caps shall be of metal construction, with threaded brass inserts. Caps shall be color-coded according to ASHRAE standards for

R22 and R410A refrigerant gasses, universal color for other refrigerant gasses. Caps shall be removable only with cap manufacturer's handheld tool.

1. Provide minimum of two (2) cap removal tools for every ten (10) air conditioning units or other systems containing refrigerant installed under this Project.

2.12 FANS

A. All fans shall be Air Moving and Control Association Inc. (AMCA) labeled.

B. Provide self-aligning, enclosed ball bearings, accessible for lubrication unless specified otherwise.

C. Provide variable speed switch for all direct drive fans.

D. Roof Mounted:

1. Direct or V-belt Drive: Provide one-piece heavy-duty ventilator housings, one piece heavy gauge spun aluminum construction, with weatherproof assembly and integral weather shield. Mount ventilators on curbs furnished by the fan manufacturer. Install with fan assembly level.
2. Fan wheels shall be centrifugal design, statically and dynamically balanced. Tip speed, rpm and motor horsepower shall not exceed listing in manufacturer's catalog for unit specified.
3. Fans shall have integral factory formed base and one piece spinning without welding. Housings shall be provided with wiring channel and are to be of the direct discharge design. Motor and fan assembly shall be on vibration isolating mounts. Fans shall have capacity, speeds and motor sizes as shown.
4. Provide the following accessories:

    a. Gravity backdraft dampers.
    b. Aluminum bird screen with a minimum of 85 percent free area.
    c. Adjustable motor pulley.
    d. Provide grease collection tray for kitchen exhaust fans.
    e. Provide ventilated roof curb for kitchen exhaust fans where exhaust duct is mounted within rated shaft.
    f. Provide hinge kit for kitchen hood exhaust fans.

E. In-Line Centrifugal Fans:

1. Centrifugal fan with airfoil blades, aluminum or steel housing, externally mounted belt-drive motor, external lube tubes, integral support brackets.
2. Provide sloped roof or flat roof type roof cap, or wall cap to suit the location indicated on the Drawings.

F. Fan Drives:

1. Drive Design: The design horsepower rating of each drive shall be at least 1.5 times, single belt drives 2 times, the nameplate rating of the motor with proper allowances for sheave diameters, speed ratio, arcs of contact and belt length.
2. Provide variable speed drives, Dayco, Browning, Woods, or equal. Allow for replacement of fan and motor drives and belts as required to suit the balance requirements of the project.
3. Select variable speed drives to allow an increase or decrease of minimum of ten percent of design fan speed.

G. Motors:

1. Motors of 25 HP and less shall have adjustable pitch sheaves; sheaves on motors above 25 HP may be non-adjustable. Change, at no extra cost to Owner, the non-adjustable sheaves to obtain desired air quantities.
2. For single-phase fan motors sized larger than 1/12 hp and smaller than 1 hp, refer to Article, Electric Motors, in Section 23 00 50, Basic HVAC Materials and Methods.

H. Sheaves: Sheaves shall be cast or fabricated, bored to size or bushed with fully split tapered bushings to fit properly on the shafts. All sheaves shall be secured with keys and set screws.

I. Belts:

1. All belts shall be furnished in matched sets.
2. Belts shall be within 1 degree 30 minutes of true alignment in all cases.

J. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. PennBarry.
4. American Coolair Corporation.

K. Owner Training: Manufacturer shall provide one on-site 1-hour training session for Owners' maintenance personnel.

2.13 KITCHEN EXHAUST HOOD – TYPE 1

A. Furnish packaged pre-manufactured ventilator, constructed of stainless steel, complete with baffles and lights. Unit shall be equal to that specified in equipment schedule.

B. Each ventilator shall be a high velocity type grease extractor.

1. Centrifugal grease extraction efficiency of 90 percent to be accomplished without the use of filters, cartridges, or constant running water. (Verify with hood selected)

C. Compensating ventilators shall not be of the short-circuiting type. Furnish integral front face discharge for up to 80 percent make-up air of the exhausted air.

D. Construction: The ventilator shall be of all stainless steel construction not less than 18 gauge, Type 304, number 4 finish. The assembly at joints and seams shall be liquid tight and all exposed external welds shall be ground and polished to match the original finish of the metal. All unexposed surfaces shall be constructed of minimum 18 gauge galvanized steel, including but not limited to duct, plenums, framing and brackets. Provide stainless steel closure panels as required for a complete finish, satisfactory to the Architect.

E. Filters: Grease Filters shall be manufactured in accordance with UL 1046.

F. Approvals: Ventilators to be listed or recognized by ICBO (refer to Research Report 2064), NSF, UL and in accordance with all recommendations of NFPA's Standard #96.

G. Fire Suppression System:

1. Fire suppression system shall be listed and labeled as conforming to NFPA 17A and UL 300, current edition.
2. Furnish wet chemical system to protect the hood, exhaust duct and cooking appliances against fire. The system shall be installed by an authorized distributor in accordance with NFPA 96, NFPA 17A, UL listings, and the requirements of authorities having jurisdiction.
3. The system shall be manually operable at the release. The system shall contain a fusible link series detector system for automatic actuation of the system. Actuation of the system shall provide automatic mechanical gas valve line shutoff. Provide manual operation, with local actuation at the tank enclosure.
4. System shall consist of suppressant, pressurizing cartridge, Schedule 40 piping and nozzles. Provide system with fresh cartridge. Provide stainless steel enclosure for cartridge, regulated release mechanism, regulator and all other material required for operation of the system.
5. System shall be Ansul R102, Kidde, or equal. Provide multiple system if required.
6. Upon completion of the installation of the fire suppression system a test of the system shall be conducted in the presence of the enforcing agency.

H. Owner Training: Manufacturer shall provide one on-site 1-hour training session for Owners' maintenance personnel.

2.14 KITCHEN EXHAUST HOOD – TYPE 2

A. General:

1. Furnish ventilator hood of size and qualities as indicated on plans, the ventilator shall be of all stainless steel construction not less than 18 gauge, Type 304, Number 4 finish.
2. Furnish condensate hoods with full perimeter welded condensate collecting gutter with 1/2 inch NPT stainless steel drain fitting.

B. Approvals: Ventilators to be listed or recognized by ICBO (Research Report 2064), NSF, UL, and in accordance with all recommendations of NFPA-96.

C. Owner Training: Manufacturer shall provide one on-site 1-hour training session for Owners' maintenance personnel.

2.15 RELIEF AND INTAKE VENTS

A. Galvanized steel housing with 1/2 inch mesh screen, counterbalanced backdraft damper and matching prefabricated curb. Omit backdraft damper on intake vents. Provide pitched roof curb for relief vents, and install with backdraft damper level.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Greenheck Fan Corporation.
2. Lauren Cook Company.
3. PennBarry.
4. American Coolair Corporation.

2.16 LOUVERS

A. Louvers shall be minimum 16 gauge steel with Bonderite and Epon gray primer and 1/2 inch square mesh, 16 gauge galvanized steel screen on the inside. Louvers shall be Airolite #609, Arrow United Industries, or equal, with 4 inch louver depth.

2.17 AIR INLETS AND OUTLETS

A. Except as otherwise indicated, provide manufacturer's standard inlets and outlets where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.

B. Ceiling, wall or floor Compatibility: Provide inlets and outlets with border styles that are compatible with adjacent ceiling, wall or floor systems, and that are specifically manufactured to fit into ceiling, wall or floor module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems that will contain each type of air outlet and inlet.

C. Refer to Schedule on Mechanical Drawings for details of inlets and outlets to be used.

2.18 AIR FILTERS

A. Provide MERV 13 disposable pleated media type. Refer to specific equipment Articles for filter depth and for exceptions to this specification. Filters shall conform to the following:

1. Standards:

    a. ASHRAE Standard 52.2-2007.
    b. Underwriters Laboratories: U.L. 900, Class 2.

2. Construction:

    a. Media: Synthetic or cotton-synthetic blend with radial pleats.
    b. Media Frame: High wet-strength beverage board.
    c. Media Support: Welded wire or expanded metal grid bonded to air leaving side of the media.

3. Performance: 2” deep filter shall have a maximum initial air resistance of 0.31 inches w.g.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Camfil Farr, Inc., model 30/30.
2. Flanders Corporation, model 40 LPD.

C. Temporary (Construction Period) Filters:

1. Install new temporary filters in all units that have filter systems installed. Temporary filters shall match the permanent filters that are specified for the units. Replace filters as needed, in accordance with manufacturer’s directions, in order to provide protection for the unit prior to occupancy by the Owner.
2. If air handling units are operated during construction of the project, install temporary filters directly over each return air inlet. Filters shall match the permanent filters that are specified for the units. Select size of filter to completely cover the frame of the return air inlet, and tape filters firmly in place to eliminate any construction debris from entering the duct system or unit. Remove the temporary filters upon completion of the work, and repair all damaged paintwork.

D. Spare Filters:

1. Furnish two new, complete sets of filter cartridges for each filter bank on completion and acceptance of the work. Install one set of filters in units (prior to final air balance). Provide units designed to accommodate washable, permanent filters with one washable, permanent filter.

2.19 DAMPERS

A. Backdraft Dampers: Ruskin CBD2, counterbalanced, Nailer Industries, or equal.

B. Manual Air and Balance Dampers: Provide dampers of single blade type or multi-blade type constructed in accordance with SMACNA, "HVAC Duct Construction Standards," except as noted herein.

1. Rectangular Ductwork:
   a. Single damper blades may be used in ducts up to 10 inches in height. Dampers shall be 16 gauge minimum. Provide self-locking regulators, equal to Ventlok 641. Provide end bearings equal to Ventlok 607 at each damper. Provide continuous solid 3/8 inch square shafts.
   b. Multiple blade dampers shall be equal to Ruskin CD35 Standard Control Damper. Maximum width for multiple damper blades for use in rectangular duct shall not exceed 6 inches.
   c. Where duct velocity may be expected to exceed 1500 fpm, provide Ruskin CD-50, or equal, low leakage dampers with airfoil blades.

2. Round Ductwork:
   a. Single damper blades may be used in ducts up to 12 inches in diameter. Provide multiple blade opposed blade dampers, with connected linkage, for ductwork larger than 12 inches in diameter.
   b. Damper blades for round ductwork shall be 20 gauge steel for ducts up to 12 inches diameter and 16 gauge steel for dampers larger than 12 inches damper. Provide self-locking regulators, equal to Ventlok 641, Durodyne, or equal for operation of dampers. Provide end bearings equal to Ventlok 607 and provide continuous solid 3/8 inch square shafts.

3. Where ductwork is externally insulated, provide self-locking regulators equal to Ventlok 644, Durodyne, or equal for rectangular ductwork, and Ventlok 637, Durodyne, or equal for round ducts.

C. Fire Dampers and Combination Fire/Smoke Dampers:

1. Fire dampers and combination fire/smoke dampers shall be listed and approved by the California State Fire Marshal. Installation shall conform to the manufacturer's UL approved installation instructions.

   a. Fire dampers shall be UL 555 classified and labeled as dynamic fire dampers approved for wall and floor installation. They shall ship from the manufacturer as an assembly with a minimum 20-gauge factory installed sleeve. Sleeve length shall suit the requirements of the wall construction. Each dynamic fire damper/sleeve assembly shall ship complete with factory "roll formed" one-piece angles with pre-punched holes for easy installation. Dynamic fire dampers for vertical installation must consist of a single section on sizes up to 33" x 36" and a single section on sizes up to 24" x 24" for horizontal installation. 1-1/2 hour dynamic fire dampers shall be Ruskin DIBD20, Pottorff, or equal. 3 hour dynamic fire dampers shall be Ruskin DIBD230, Pottorff, or equal.
   b. Fire dampers for high pressure/velocity systems where velocities exceed 2000 fpm and/or 4" w.g. pressure fire damper shall be Ruskin FD60, Pottorff, or equal.
   c. Fire dampers for ceiling installation shall be UL 555C classified and labeled as ceiling dampers. They shall be provided with a thermal insulating blanket to fit the inlet or outlet condition if required by the application. Ceiling dampers shall be Ruskin CFD 2, 3, 4 or 5. Ceiling dampers for ceilings

constructed of wood shall have UL tested in design L501 and shall be Ruskin CFD7, Pottorff, or equal.

d. Combination fire/smoke dampers. Dampers shall be UL classified and labeled as Leakage Class I Smoke Dampers in accordance with the latest version of UL 555S. Dampers shall be warranted to be free from defects in material and workmanship for a period of 5 years after date of shipment. Damper/actuator assembly shall be tested to full open and full close at minimum 2000 fpm 250° F heated air and 4" w.g. with airflow in both directions. (Specified select: 250° / 350°, 2000 fpm/3000 fpm). Each damper shall be equipped with "controlled closure" quick detect heat actuated release device to prevent duct and HVAC component damage resulting from instantaneous damper closure. Release device shall be EFL type and shall allow reset from outside the sleeve after moderate temperature exposure. (Replacement type fusible links not acceptable.)

e. Two position combination fire smoke dampers shall be equipped with one or more factory installed, direct coupled, 120 volt, single phase, electric actuator for energize open – fail close operation. Dampers with multiple actuators shall be factory wired with single point connection at the EFL heat release device for connection to power. Damper actuator shall include minimum one-year energized hold open (no cycles) and spring return (fail) close reliability. Damper/actuator shall include minimum 20,000 full open-full close cycle performances.

f. Modulating combination fire smoke dampers shall be equipped with one or more factory installed contact for modulating signal connection. Damper/actuator shall include minimum 100,000 full open-full close cycle performances with spring return (fail) close on loss of power.

g. Round combination fire smoke dampers up to 24" diameter shall be true round type with minimum 20 gauge galvanized steel designed for lowest pressure drop and noise performance. Bearings shall be stainless steel sleeve turning in an extruded hole in the frame. Blade seals shall be silicone edge designed to withstand 450° F and galvanized steel mechanically locked in to the blade edge (adhesive type seals are not acceptable). Each damper shall be equipped with a factory-installed sleeve of 17 inches minimum length and factory "roll formed" one-piece angles with pre-punched holes. Dampers shall be Ruskin FSDR25, Pottorff, or equal.

h. Round (larger than 24" diameter) or rectangular combination fire smoke dampers shall include roll-formed structural hat channel frame, reinforced at the corners, formed from a single piece of minimum 16 gauge equivalent thickness formed from single piece galvanized steel. Bearings shall be stainless steel turning in an extruded hole in the frame. Blade edge seals shall be silicone rubber designed to withstand 450° F and galvanized steel mechanically locked in to the blade edge (adhesive type seals are not acceptable). Each damper shall be equipped with a factory-installed sleeve of 17" minimum length and factory "roll formed" one-piece angles with pre-punched holes for easy installation. Dampers shall be Ruskin FSD60, Pottorff, or equal.

i. 3-hour rated combination fire smoke dampers shall be Ruskin model FSD60-3, Pottorff, or equal.

j. All FSD60 type dampers shall be AMCA licensed and shall bear the AMCA Seal for Air Performance. AMCA certified testing shall verify pressure drop

does not exceed .03" w.g. at a face velocity of 1,000 fpm on a 24" x 24" damper.

k. Wall type fire/smoke damper:

1) Combination fire/smoke dampers for use in the wall of exit corridors shall be classified and labeled as Leakage Class II Smoke Dampers in accordance with the latest version of UL 555S. Dampers shall meet the requirements for combination fire/smoke dampers in paragraph 3 above except AMCA certified testing shall verify pressure drop does not exceed .07" w.g. at a face velocity of 1,000 fpm on a 24" x 24" damper and blades shall be single skin galvanized steel 10 gauge minimum with 3 longitudinal grooves for reinforcement. Dampers shall be Ruskin FSD36, Pottorff, or equal.

2) Front access combination fire/smoke dampers shall meet all the requirements for combination fire/smoke dampers in paragraph 3 above except pressure drop requirement. In addition the dampers shall be constructed so that actuators and all accessories are accessible from the grille side. Actuators and accessories shall be housed within an integral cabinet on the side of the damper frame and shall not be installed in the air stream in front of the damper. The damper sleeve shall be minimum 14" and flanged to accept a steel framed grille. The sleeve shall be covered with fire resistant material. Dampers shall be Ruskin FSD60FA, Pottorff, or equal.

l. Ceiling type fire/smoke damper for tunnel type corridor construction: Combination fire/smoke dampers for use in the corridor ceiling of tunnel type corridor construction shall be UL classified and labeled as Corridor Damper. Dampers shall meet the requirements of paragraph 4a above except pressure drop testing does not require AMCA certification. Dampers shall be Ruskin FSD36C, Pottorff, or equal.

m. Fusible links shall have temperature rating approximately 50° F above normal maximum operating temperature of the heat producing appliance.

1) If project requires re-openable fire/smoke dampers, provide Ruskin 165 ° F / 350° F TS150, NCA or equal. The TS150 firestat replaces the EFL and allows the damper to be re-opened from remote location up to 350 ° F. TS150 shall include full open and full closed damper position contacts for interface with remote position indication panel.

2) Each fire/smoke damper shall be equipped with "controlled closure" quick detect heat actuated release device to prevent duct and HVAC component damage. Release device shall allow easy reset after moderate temperature rise outside the sleeve. Heat release device shall be the Ruskin EFL, NCA or equal.

3) Unless the system is using a validation control system, each fire/smoke damper shall be equipped with a control panel including blade position indicator lights and a key operated switch. The panel cover shall be oversized for flush mount into the wall or ceiling and shall have a brushed look. Control panel shall be Ruskin MCP2, Pottorff, or equal.

2. All actuators used for smoke dampers or combination fire/smoke dampers shall have a cycle time requirement of not more than every twelve months and shall be rated for continuous "0n" duty and shall be provided with internal spring return. Actuators shall be equipped with pilot light, remote key test switch, end switch and circuitry to activate pilot light on remote key (test) switch located in corridor ceiling adjacent to damper. Electric motors shall be Invensys MA-250, MA-253, Honeywell H2000, or equal.

D. Where required to suit the size of damper required, provide manufacturers standard UL Classified mullions, arranged to support multiple dampers. Assembly shall be of minimum 16 gauge galvanized steel, complete with all accessory caps and framing members required for installation.

2.20 DUCTWORK

A. Construct and install sheet metal ductwork in accordance with the California Mechanical Code for 2 inches static pressure for supply air, and 2 inches minimum for return and exhaust air unless otherwise noted on Drawings.

1. Where not in conflict with the California Mechanical Code, construct and install all sheet metal ductwork in accordance with SMACNA HVAC Duct Construction Standards (Metal and Flexible). Where applicable for HVAC work, construct and install sheet metal work in accordance with SMACNA Architectural Sheet Metal Manual.
2. Provide variations in duct size, and additional duct fittings as required to clear obstructions and maintain clearances as approved by the Architect at no extra cost to the Owner.
3. Gauges, joints and bracing shall be in accordance with the California Mechanical Code.
4. Provide beading or cross breaking for all ductwork inside building. Provide cross breaking for ductwork exposed to weather.
5. At the contractor's option, ductwork may be fabricated using the Ductmate, Nexus, Quickduct, Transverse Duct Connection (TDC), Pyramid-Loc duct connection systems, or equal. Fabricate in strict conformance with manufacturer's written installation instructions and in accordance with California Mechanical Code.

    a. Seal flanged ends with pressure sensitive high density, closed cell neoprene or polyethylene tape gasket, Thermo 440, or equal.
    b. Provide metal clips for duct connections, except at breakaway connections for fire dampers and fire smoke dampers. Provide corner clips at each corner of duct, through bolted, at all locations except at breakaway connections for fire dampers and fire smoke dampers. Where used on locations exposed to weather, provide continuous metal clip at top and sides of duct, with 1 inch overhang for top side.

B. Design and installation standards:

1. SMACNA Compliance: Comply with applicable portions of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) for all work in this section.
2. NFPA Compliance: Comply with ANSI/NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," and ANSI/NFPA 90B, "Standard for the Installation of Warm Air Heating and Air Conditioning Systems."
3. California Mechanical Code.

C. Duct sizes indicated are external sizes.

D. Galvanized Sheet Steel: Lock-forming quality, ASTM A924 and ASTM A653, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.

1. Provide mill certification for galvanized material at request of the Project Inspector.

E. Duct Sealants:

1. Sealant shall have a VOC content of 250 g/L or less.
2. Sealant shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
3. Provide one part, non-sag, synthetic latex sealant, formulated with a minimum of 68 percent solids. Sealant shall comply with ASTM E84, Surface Burning Characteristics.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1) Design Polymerics, model DP1010.
2) Polymer Adhesive Sealant Systems Inc, model Airseal #11.
3) McGill Airseal, LLC.

F. Duct Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, straps, trim, and angles for support of ductwork.

G. Rectangular Duct Fabrication:

1. Shop fabricate ductwork of gauges and reinforcement complying with the more stringent of the following standards, except as noted herein.

a. SMACNA HVAC Duct Construction Standards
b. California Mechanical Code

2. Fabricate ducts for 2 inch pressure class with minimum duct gauges and reinforcement as follows, except as otherwise noted:

Table A

Duct Dimension	Minimum Gauge	Joint Reinforcement Per CMC
Through 12"	26	Not Required
13" through 18"	24	Not Required
19" through 30"	24	C/4
31" through 42"	22	E/4
43" through 54"	22	F/2
55" through 60"	20	G/4
61" through 84"	20	I/2
85" through 96"	20	J/2
Over 96"	18	K/2

3. Fabricate duct fittings to match adjoining ducts and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1.5 times associated duct width. Fabricate to include single thickness turning vane in elbows where space does not permit the above radius or where square elbows are shown. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers. Turning vanes shall be E-Z Rail II, Durodyne, or equal.
4. Fabricate round supply connections at rectangular, plenum type fittings using spin-in type fittings, complete with extractor and volume control damper. Refer to Paragraph “DAMPERS” for damper requirements.
5. Provide drive slip or equivalent flat seams for ducts exposed in the conditioned space or where necessary due to space limitations. On ducts with flat seams, provide standard reinforcing on inside of duct. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.
6. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
7. Provide 20 gauge minimum for ductwork exposed within occupied spaces.

H. Rectangular Internally Insulated Duct Fabrication:

1. Provide internal duct lining where indicated on the Drawings, with a minimum of 10'-0" length in each direction from the fan, fan casing, or unit casing. Line all transfer ducts.

a. Where ductwork is exposed to weather or outside the building insulation envelope, provide 2 inch thick, 1-1/2 pound density internal lining with matte facing, with an R-Value of 8.0 minimum.
b. Where ductwork is within the building insulation envelope, lining shall be 1" thick, 1-1/2 pound density, with R-value of 4.2 minimum.
c. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
d. Where installed exposed in the conditioned space, duct shall be minimum 20 gauge with 1 inch insulation layer (minimum R-value – R-4.2).
e. Cement duct liner in place with nonflammable, non-hardening duct adhesive. Seal all raw edges of insulation inside ductwork with adhesive, including longitudinal liner edges.
f. Provide metal nosing at all locations where liner is preceded by unlined metal.
g. Provide sheet metal weld pins and washers or clinch pins and washers on all ductwork on 12 inch intervals with the first row within 3 inches of the leading edge of each piece of insulation and within 4 inches of corners. No use of adhesive mounted pins will be considered.

    1) Install clinched pin fasteners with properly adjusted automatic fastening equipment. Manual installation will not be considered.
    2) Install weld pins with properly adjusted automatic fastening equipment. Installation shall not damage the galvanized coating on the outside of the duct.

h. All ductwork, adhesives, lining, sealant, flex duct and the like shall have a flame spread of 25 or less and developed smoke rating of 50 or less when tested in accordance with one of the following test methods: NFPA 255, ASTM E84, or UL 723.
i. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

Manufacturer:	Product:
Johns Manville	Linacoustic RC
CertainTeed Corporation	ToughGard
Fosters Adhesive	85-62
Swifts Adhesive	7336

I. Round and Oval Ductwork Fabrication:

1. Round and oval duct and fittings shall be spiral lockseam or longitudinal seam as indicated in table below. Provide couplings to join each length of duct.

   a. At contractors' option, round or oval ductwork may be utilized in place of rectangular ductwork shown on Drawings, provided available space allows installation of round or oval ductwork without compromising space required for installation of products and systems of other trades.

      1) Round or oval ductwork utilized in place of rectangular ductwork shown on Drawings shall be sized to have a static pressure loss equivalent to rectangular duct shown on Drawings.
      2) Unlined round or oval duct shall not be utilized in place of rectangular internally lined ductwork shown on Drawings.

2. Fabricate duct fittings to match adjoining ducts and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1.5 times associated duct width. Provide two-piece, die-stamped, 45-degree to 90-degree elbows for sizes up to 12 inches; five-piece, 90-degree elbows for sizes 12 inches and above; conical tees; and conical laterals. All reducers shall be placed after a tap has been made on the duct main. Reducers shall be long-taper style.
3. Round Ductwork: Construct of galvanized sheet steel complying with ANSI/ASTM A 653 by the following methods and in minimum gauges listed.

Diameter	Minimum Gauge	Method of Manufacture
Up to 14"	26	Spiral Lockseam
15" to 23"	24	Spiral Lockseam
24" to 36"	22	Spiral Lockseam
37" to 50"	20	Spiral Lockseam
51" to 60"	18	Spiral Lockseam
Over 60"	14	Longitudinal Seam

4. Provide locked seams for spiral duct; fusion welded butt seam for longitudinal seam duct.
5. Fittings and Couplings: Construct of minimum gauges listed. Provide continuous welds along seams at exposed ducts. Provide spot weld bonded seams at concealed ducts.

Diameter	Minimum Gauge

3" to 36"	20
38" to 50"	18
Over 50"	16

6. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
7. Provide 20 gauge minimum for ductwork exposed within occupied spaces.

J. Round Internally Insulated Duct and Fittings: Where ductwork is exposed to weather or outside the building insulation envelope, construct with outer pressure shell, 2 inch thick (Minimum R-value = R-8) insulation layer, and perforated inner liner. Where ductwork is within the building insulation envelope, construct with outer pressure shell, 1 inch thick (minimum R-value = R4.2) insulation layer, and perforated inner liner. Construct shell and liner of galvanized sheet steel complying with ANSI/ASTM A 653, of spiral lockseam construction (use longitudinal seam for over 59 inches), in minimum gauges listed in table below. Where installed exposed in the conditioned space: duct and fitting outer pressure shell shall be minimum 20 gauge with 1 inch insulation layer (minimum R-value = R-4.2), and perforated inner liner.

Nominal Duct Diameter	Outer Shell	Inner Liner
3" TO 12"	26 gauge	24 gauge
13" TO 24"	24 gauge	24 gauge
25" to 34"	22 gauge	24 gauge
35" to 48"	20 gauge	24 gauge
49" to 58"	18 gauge	24 gauge
Over 59"	16 gauge	20 gauge

1. Fittings and Couplings: Construct of minimum gauges listed. Provide continuous weld along seams of outer shell at exposed ducts. Provide spot weld bonded seams at concealed ducts.

Nominal Duct Diameter	Outer Shell	Inner Liner
3" to 34"	20 gauge	24 gauge
36" to 48"	18 gauge	24 gauge

Over 48"	16 gauge	24 gauge

2. Inner Liner: Perforate with 3/32 inch holes for 22 percent open area. Provide metal spacers welded in position to maintain spacing and concentricity.
3. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
4. Where installed exposed in the conditioned space, duct shall be minimum 20 gauge with 1 inch insulation layer (minimum R-value – R-4.2).
5. All ductwork, adhesives, lining, sealant, flex duct and the like shall have a flame spread of 25 or less and developed smoke rating of 50 or less when tested in accordance with one of the following test methods: NFPA 255, ASTM E84, or UL 723.
6. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

    a. Sheet Metal Div., McGill AirFlow, LLC., Acousti-k27
    b. Semco Duct and Acoustical Products, Inc.
    c. Air Systems Manufacturing, Inc. - Las Vegas

K. Duct Access Doors:

1. Duct Access: Provide hinged access door in rectangular ducts for access to fire dampers, control equipment, etc. Access door size shall be duct diameter wide by duct diameter high for all ducts under 24 inches. Ducts over 24 inches in diameter shall have 24-inch by 18-inch access doors. Minimum size access doors shall be 6 inches by 6 inches.
2. Provide hinged style access doors for round ductwork, NCA Manufacturing, Inc., Model AD-RD-87, Pottorff Series 60, or equal. Access doors shall be 16 gauge galvanized steel with continuous piano hinge. Locks shall be plated steel strike and catch. Provide 1" x 3/8" Polyethylene "Perma Stik" gasket all around door.

L. Flexible Air Ducts:

1. Provide exterior reinforced laminated vapor barrier, fiberglass insulation, encapsulated spring steel wire Helix, and impervious, smooth, non-perforated interior vinyl liner. Individual lengths of flexible ducts shall contain factory fabricated steel connection collars.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

        1) C.A. Schroeder, Inc., Cal Flex model 2PMJ.
        2) ThermaFlex model M KC.

2. Factory made air ducts shall be approved for the use intended and shall conform to the requirements of UL 181 and NFPA 90A. Each portion of a factory-made air

duct system shall be identified by the manufacturer with a label or other suitable identification indicating compliance with UL 181, Class 1. Ducts shall be UL listed Class 1, maximum 25/50 smoke and flame spread and shall be installed in accordance with the terms of their listing and the requirements of SMACNA HVAC Duct Construction Standards (Metal and Flexible). Factory-made air ducts shall have the following minimum R-values: R-6.0 for ductwork installed within the building insulation envelope, R-8.0 for ductwork installed outside the building insulation envelope.

3. Flexible ductwork shall be maximum of 5 feet long, and shall be extended to the fullest possible length, in order to minimize pressure drop in the duct.
4. Flexible ducts shall be selected for minimum of 6 inch positive static pressure and minimum of 1 inch negative static pressure.

M. Kitchen Exhaust Ducts (Type 1):

1. Fabricate kitchen exhaust ducts and supports used for removal of smoke and grease-laden air from cooking equipment of 16 gauge minimum black steel where concealed and of 18 gauge minimum Type 304 stainless steel where exposed. At Contractor’s option, 18 gauge minimum Type 304 stainless steel may be used where concealed. Finish exposed stainless steel with Number 4 finish. All ductwork shall be of welded construction in accordance with Section 510 of California Mechanical Code. For duct construction, comply with SMACNA "HVAC Duct Construction Standards" and ANSI/NFPA 96 “Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.”
2. Kitchen Exhaust Duct Access Panels:

    a. Provide listed duct access panel assembly of the same material and gauge used for the duct. Duct access panels shall conform to the following:

        1) Fasteners: Black steel or stainless steel to match material used for the duct. Panel fasteners shall not penetrate duct wall.
        2) Gasket: Comply with NFPA 96, grease-tight, high temperature ceramic fiber, rated for minimum 1500 °F.
        3) Minimum Pressure rating: 10 inches wg., positive or negative.

    b. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) Ductmate Industries, Inc.
        2) 3M.
        3) Flame Gard, Inc.

3. Field-Applied Grease Duct Enclosure:

    a. Thermal Ceramics Firemaster FastWrap XL, or equal, field-applied grease duct enclosure listed in accordance with ASTM E 2336.

N. Kitchen Exhaust Ducts (Type 2):

1. Cooking Equipment Exhaust Ducts:

a. Fabricate kitchen exhaust ducts and supports used for removal of vapor, heat and odors from cooking equipment of 16 gauge minimum black steel where concealed and of 18 gauge minimum Type 304 stainless steel where exposed. At Contractor's option, 18 gauge minimum Type 304 stainless steel may be used where concealed. Finish exposed stainless steel with Number 4 finish. All ductwork shall be of welded construction in accordance with Section 510 of California Mechanical Code. For duct construction, comply with SMACNA "HVAC Duct Construction Standards" and ANSI/NFPA 96 "Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations."

2. Dishwasher Exhaust Ducts:

a. Fabricate dishwasher exhaust ducts and supports used for steam removal from dishwasher of 18 gauge minimum 304 stainless steel. All ductwork shall be of welded construction in accordance with Section 510 of California Mechanical Code. For duct construction, comply with California Mechanical Code, SMACNA "HVAC Duct Construction Standards," and ANSI/NFPA 96 "Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations."

3. Duct Access Panels:

a. Provide duct access panel assembly of the same material and gauge used for the duct. Duct access panels shall conform to the following:

1) Fasteners: Black steel or stainless steel to match material used for the duct. Panel fasteners shall not penetrate duct wall.
2) Gasket: Comply with NFPA 96, grease-tight, high temperature ceramic fiber, rated for minimum 1500 °F.

O. Type 2 Clothes Dryer Exhaust Ducts:

1. Fabricate ducts and supports of 18 gauge minimum, Type 304, stainless steel. All duct seams and joints shall be welded. Finish exposed stainless steel with Number 4 finish.

P. Shower exhaust ducts: Provide ducts and supports from stainless steel for a length of 20 feet from exhaust grille or register.

Q. Flexible Connectors:

1. Materials: Flame-retardant or noncombustible fabrics. Coatings and adhesives shall comply with UL 181, Class 1, with flame spread index of 25 or less, and smoke-developed index of 50 or less.
2. Metal-Edged Connectors: Factory fabricated with a fabric strip 3 inches wide attached to two strips of 3-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

3. Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

    a. Minimum Weight: 26 oz./sq. yd.
    b. Tensile Strength: Minimum 475 lbf/inch in the warp and minimum 375 lbf/inch in the filling.
    c. Service Temperature: Minus 50 to plus 200 deg F.

4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

    a. Ductmate Industries, Inc., model Proflex.
    b. Ventfabrics, Inc., model Ventlon.

2.21 THERMAL AND SEISMIC EXPANSION LOOPS

A. Manufactured assembly consisting of inlet and outlet elbow fittings, two sections of flexible metal hose and braid, and 180-degree return bend. Return bend section shall have support lug and plugged FPT drain. Flexible hose shall consist of corrugated metal inner hose and braided metal outer sheath. Assemblies shall be constructed from materials compatible with the fluid or gas being conveyed and shall be suitable for the system operating pressure and temperature. Provide assembly selected for 4 inches of movement.

B. Basis-of-Design Product: Subject to compliance with requirements, provide Metraflex Inc., Metraloop series, or comparable product by one of the following, or equal:

1. Flexicraft Industries.

2.22 PIPE JOINING MATERIALS

A. Refer to Division 22 and 23 piping sections for special joining materials not listed below.

B. Brazing Filler Metals:

1. General Duty: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
2. Refrigerant Piping:

    a. Joining copper to copper: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
    b. Joining copper to bronze or steel: AWS A5.8, Bag-1, silver alloy unless otherwise indicated.

2.23 INSULATION MATERIALS

A. General:

1. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).
2. Products shall not contain asbestos, lead, mercury, or mercury compounds.
3. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
4. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
5. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
6. Test insulation, jackets and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723 or ASTM E84.
7. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.

B. Insulation Materials:

1. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

        1) Aeroflex USA, Inc.
        2) Armacell LLC.
        3) K-Flex USA.

2. Mineral-Fiber, Preformed Pipe Insulation:

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

        1) Johns Manville; a Berkshire Hathaway company.
        2) Knauf Insulation.
        3) Manson Insulation Inc.
        4) Owens Corning.

    b. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL.

3. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Provide 2-inch wide stapling and taping flange.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1) CertainTeed Corporation.
2) Johns Manville.
3) Knauf Insulation.
4) Owens Corning.

C. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. Design Polymerics.
b. Foster Brand; H. B. Fuller Construction Products.
c. Knauf Insulation.

2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
3. Service Temperature Range: 0 to plus 180 deg F.
4. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. Design Polymerics.
b. Childers Brand; H. B. Fuller Construction Products.
c. Foster Brand; H. B. Fuller Construction Products.

2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. Design Polymerics.
b. Childers Brand; H. B. Fuller Construction Products.
c. Foster Brand; H. B. Fuller Construction Products.
d. Knauf Insulation.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: 0 to plus 180 deg F.
4. Color: White.

F. Field Applied Jackets:

1. PVC Jacket and Factory Fabricated Fitting Covers: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1) Johns Manville, model Zeston, with Zeston 2000 fitting covers.
2) Proto Corporation, model LoSmoke.

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
1) Childers Brand; H. B. Fuller Construction Products.
2) ITW Insulation Systems; Illinois Tool Works, Inc.
3) RPR Products, Inc.

b. Finish and thickness are indicated in field-applied jacket schedules.
c. Moisture Barrier for Outdoor Applications: 2.5-mil- thick polysurlyn.
d. Factory-Fabricated Fitting Covers:

1) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
2) Tee covers.
3) Flange and union covers.
4) End caps.
5) Beveled collars.
6) Valve covers.
7) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.24 THERMAL HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Buckaroos, Inc.
2. Carpenter & Paterson, Inc.

3. Clement Support Services.
4. Rilco Manufacturing Co., Inc.

B. Flame-spread index of 25 or less and smoke-developed index of 50 or less as tested by ASTM E 84.

C. Insulation-Insert Material for Cold or Hot Piping, from Minus 40 to Plus 275 Deg F: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength or ASTM C 1126, Type III rigid phenolic foam and vapor barrier.

1. Phenolic:

a. NPS 10 and Smaller: 3.75-lb/cu. Ft. minimum compressive strength.
b. NPS 12 to NPS 30: 5.0-lb/cu. ft. minimum compressive strength.

D. Insulation-Insert Material for Piping Above 275 Deg F: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig or ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.

E. Insulation Protection Shields: Galvanized metal, G90 coating designation, complying with ASTM A 653/A 653M, 180-degree saddle.

F. Heavy Duty Insulation Protection Shields: Galvanized metal, 12-gage, G90 coating designation, complying with ASTM A 653/A 653M, 180-degree saddle. Structural steel plate welded to bottom of galvanized shield for sizes NPS 6 and larger.

G. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

H. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

I. Insert Length: Extend minimum 1-1/2 inches beyond sheet metal shield.

2.25 TEMPERATURE CONTROL SYSTEM

A. Refer to Section 23 09 23, Direct Digital Control System for HVAC.

PART 3 - EXECUTION

3.1 ROOF MOUNTED EQUIPMENT INSTALLATION

A. Mount and anchor equipment in strict compliance with Drawings details. Alternate anchorage methods will not be considered for roof mounted equipment.

B. Examine rough-in for roof mounted equipment to verify actual locations of piping and duct connections prior to final equipment installation.

C. Verify that piping to be installed adjacent to roof mounted equipment allows service and maintenance.

D. Verify that gas piping will be installed with sufficient clearance for burner removal and service.

E. Install ducts to termination at top of roof curb and install heavy duty rubber gaskets on supply and return openings and on full perimeter of curb, or as required for an airtight installation, prior to setting unit on curb.

F. Cover roof inside each roof mounted air conditioning unit, heat pump unit, and heating and ventilating unit roof curb with 2 inch thick, 3 pound density fiberglass insulation board.

G. Connect supply and return air ducts to horizontal discharge roof mounted equipment with flexible duct connectors. Provide G 90 galvanized steel weather hood over flexible connections exposed to the weather. Weather hood minimum gauge shall be per PART 2 article, Ductwork, Table A.

H. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.

3.2 SPLIT SYSTEM AC, HEAT PUMP, AND VRF SYSTEMS INSTALLATION

A. General:

1. Install units level and plumb.
2. Install evaporator-fan components as detailed on Drawings.
3. Install ground or roof- mounted condensing units as detailed on Drawings.
4. Install seismic restraints as required by applicable codes. Refer to Article, Submittals, in Section 23 00 50, Basic HVAC Materials and Methods, for delegated design requirements for seismic restraints.
5. Install and connect refrigerant piping as detailed in unit manufacturers' literature. Install piping to allow access to unit.
6. Install cooling coil condensate primary drain pan piping, and overflow, if provided, and run to nearest code-compliant receptacle, or as indicated on Drawings. Install secondary drain pan for units installed over permanent and suspended-tile ceilings. Install secondary drain pan piping and terminate 1/2 inch below ceiling, with escutcheon, in a readily visible location or as shown on Drawings.
7. Install air filters at each indoor unit. Install washable, permanent filters at indoor units designed to accept washable, permanent filters. Refer to Drawings schedule, and Article, Air Filters, in this Section, for filter requirements for ducted, above-ceiling units incorporating mixing boxes.
8. Duct Connections: Duct installation requirements are specified in Article, Ductwork, in this Section. Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Article, Ductwork, in this Section.

3.3 HIGH EFFICIENCY FURNACE UNIT INSTALLATION

A. Install vent and combustion air piping in strict compliance with manufacturer's installation guidelines. Pipe and fittings shall comply with manufacturer's instructions, flash through roof or wall as specified for piping. Refer to Drawings for special conditions.

1. Provide concentric flue system with single roof or wall penetration. Install in accordance with manufacturer's requirements.
2.

B. Mount horizontally or vertically as indicated on Drawings. Comply with manufacturer's installation requirements specific to mounting orientation.

C. Install cooling coil overflow drain piping and run to nearest receptacle, or as indicated on Drawings.

3.4 REFRIGERANT PIPING INSTALLATION

A. General:

1. Install refrigerant piping according to ASHRAE 15. Install and connect refrigerant piping as detailed in unit manufacturers' literature. Install piping to allow access to unit.
2. Install piping straight and free of kinks, restrictions or traps.
3. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
4. Slope horizontal suction piping 1 inch/10 feet towards compressor.
5. Install fittings for changes in direction and branch connections.
6. Piping under raised floors shall be kept 6 inches minimum above ground; excavate as necessary.
7. Install locking caps on refrigerant access valves located outside building, including valves located on roofs.
8. Insulate refrigerant piping, including liquid and hot gas pipes when required by system manufacturer, and including headers, branches, and other components as detailed in unit manufacturers' literature.

B. Factory Pre-charged and sealed line set piping:

1. Keep the entire system clean and dry during installation.
2. All tubing shall be evacuated and sealed at the factory. The seal must not be broken until ready for assembly.
3. If there is any evidence of dust, moisture, or corrosion, the tubing must be cleaned out by drawing a swab soaked with methyl alcohol through the tubing as many times as necessary to thoroughly clean the tubing.
4. Where line set piping is used, enclose in iron or steel piping and fittings or in EMT conduit.

C. Field Assembled Refrigerant Piping:

1. Select system components with pressure rating equal to or greater than system operating pressure.
2. Where subject to mechanical injury, enclose refrigerant piping in EMT conduit.
3. Where field assembled refrigerant piping is exposed mounted at grade, on walls, and on roof, enclose in 16 gage galvanized steel enclosure.
4. When brazing, remove solenoid valve coils and sight glasses, also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

3.5 FAN INSTALLATION

A. Provide access doors for fans or motors mounted in ductwork.

B. Mount all fans as detailed on Drawings and in compliance with CBC standards.

C. Fan motors mounted in air-stream to be totally enclosed.

D. Completely line supply, return or exhaust fan cabinets with 1 inch thick, 3/4 pound density acoustic insulation securely cemented in place.

E. Roof fans shall be mounted level.

F. Provide heavy-duty rubber gasket between exhaust fan mounting flange and roof curb, or as required for an airtight installation.

3.6 RELIEF VENT INSTALLATION

A. Install relief vents to provide a level mounting for backdraft damper.

3.7 AIR INLETS AND OUTLETS INSTALLATION

A. Provide all air inlets and outlets with gaskets and install so that there will be no streaking of the walls or ceilings due to leakage. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.

B. Unless otherwise indicated on Drawings, provide rectangular galvanized steel plenum on top of each diffuser and ceiling return for connection to ductwork. Line plenum with internal insulation as indicated for lined ductwork. Size plenum to allow full opening into air terminal. Plenum sheet metal gauge shall be equal to gauge for rectangular equivalent of the branch duct serving the air inlet or outlet.

C. Ceiling-mounted air inlets, outlets, or other services installed in T-Bar type ceiling systems shall be positively attached to the ceiling suspension main runners or to cross runners with the same carrying capacity as the main runners.

1. Air inlets, outlets, or other services weighing not more than 56 pounds shall have two No. 12 gauge hangers connected from the terminal or service to the structure above. These wires may be slack.
2. Support air inlets, outlets, or other services weighing more than 56 pounds directly from the structure above by approved hangers. Provide 4 taut 12 gauge wires each, attached to the fixture and to the structure above. The 4 taut 12 gauge wires, including their attachment to the structure above must be capable of supporting 4 times the weight of the unit.
3. Secure air inlets and outlets to main runners of ceiling suspension system with two No. 8 sheet metal screws at opposing corners.

D. Furnish all air inlets and outlets with a baked prime coat unless otherwise noted. Provide off-white baked enamel finish on ceiling-mounted air inlets and outlets. Paint exposed mounting screws to match the material being secured.

E. Air inlets and outlets shall match all qualities of these specified including appearance, throw, noise level, adjustability, etc.

3.8 FILTER HOUSING INSTALLATION

A. Mount filters in airtight galvanized steel housings furnished by the filter manufacturer, or shop fabricated. Housings shall incorporate integral tracks to accommodate filters, and flanges for connection to duct or casing system.

1. Sealing: Incorporate positive-sealing gasket material on channels to seal top and bottom of filter cartridge frames and to prevent bypass of unfiltered air.
2. Access Doors: Hinged, with continuous gaskets on perimeter and positive-locking latch handle devices.

B. Air filters shall be accessible for cleaning or replacement.

C. Identify each filter access door with 1/2 inch high minimum stenciled letters.

3.9 TEMPORARY FILTERS

A. Provide temporary filters for fans that are operated during construction; after construction dirt has been removed from the building install new filters at no additional cost to the Owner. In addition to temporary filters at filter location, provide temporary filters on all duct openings which will operate under a negative pressure.

1. Filters used for temporary operation shall be the same as permanent filters for the application. Filters used for duct openings may be 1 inch thick pleated media disposable type.

3.10 DAMPER INSTALLATION

A. All dampers automatically controlled by damper motors are specified under "Temperature Control System" except those specified with items of equipment.

B. Provide opposed blade manual air dampers at each branch duct connection and at locations indicated on the drawings and where necessary to control air flow for balancing system. Provide an opposed blade balancing damper in each zone supply duct. Provide an access panel or Ventlok flush type damper regulator on ceiling or wall for each concealed damper.

C. Install fusible link fire dampers full size of duct at points where shown or required.

D. Provide 18 inch x 12 inch minimum hinged access doors in ductwork and furring for easy access to each fire damper; insulated access doors in insulated ducts. Label access doors with 1/2 inch high red letters.

1. Provide Ventlok Series 100, Durodyne, or equal access doors with hardware for convenient access to all automatic dampers and other components of the system, insulated type in insulated ducts. Provide Ventlok #202 for light duty up to 2 inch thick doors, #260 heavy-duty up to 2 inch thick doors and #310 heavy-duty for greater than 2 inch thick doors. Provide #260 hinges on all hinged and personnel access doors; include gasketing.

3.11 DUCTWORK INSTALLATION

A. General:

1. Assemble and install ductwork in accordance with recognized industry practices which will achieve air tight and noiseless (no objectionable noise) systems capable of performing each indicated service. Install each run with minimum of joints. Align ductwork accurately at connections within 1/8 inch misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers, and anchors of type which will hold ducts true to shape and to prevent buckling. Where possible, install ductwork to clear construction by 1/4 inch minimum, except at air inlets and outlets. Where ductwork will not clear construction, secure duct firmly to eliminate noise in the system.
2. Duct Joints: Install duct sealers, pop rivets or sheet metal screws at each fitting and joint. Duct sealers shall be fire retardant. Sheet metal screws for joints shall be minimum #10 size galvanized.
3. Where ductwork is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
4. Horizontal runs of ductwork suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from the Architect.
5. Provide sheet metal angle frame at all duct penetrations to wall, floor, roof, or ceiling.
6. Paint inside of ducts, visible through grille, dull black.

7. Where ductwork is installed in finished areas of buildings that do not have ceilings, paint ductwork, support hangers, and air inlets and outlets to match adjacent architectural surfaces, or as directed by Architect.
8. At the time of rough installation, or during storage on the construction site and until final startup of the heating and cooling equipment, duct and other related air distribution component openings shall be covered with tape, plastic, sheet metal, or other methods acceptable to the enforcing agency.

B. Firestopping:

1. Pack the annular space between duct openings and ducts penetrating floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.

    a. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.

2. Firestopping systems to be installed in strict accordance with manufacturer's instructions.
3. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.

C. Flashing:

1. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
2. Refer to Division 07 specifications and Drawings details as applicable.
3. Flashing for penetrations of roof for mechanical items such as flues and ducts shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.

    a. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
    b. Flues and ducts shall have 24 gauge galvanized sheet metal storm collar securely clamped to the flue above the flashing.

D. Upper connection of support to wood structure shall be with wood screws or lag screws in shear fastened in the upper one half of the wood structural member. Fasteners shall conform to the following schedule:

For ducts with P/2=30"	#10 x 1-1/2" wood screw
For ducts with P/2=72"	1/4"x 1-1/2" lag screw
For ducts with P/2 over 73"	3/8"x 1-1/2" lag screw

E. Upper connection in tension to wood shall not be used unless absolutely necessary. Where deemed necessary the contractor shall submit calculations to show the size fastener and penetration required to support loads in tension from wood in accordance with the following schedule:

For ducts with P/2=30"	260 pounds per hanger
For ducts with P/2=72"	320 pounds per hanger
For ducts with P/2=96"	460 pounds per hanger
For duct with P/2 larger than 120"	NOT ALLOWED

F. Install concrete inserts for support of ductwork in coordination with formwork as required to avoid delays in work.

G. Upper connection to manufactured truss construction must comply with truss manufacturers published requirements and Structural Engineers requirements.

H. Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct plus insulation with sheet metal flanges of same gauge as duct. Overlap opening on four sides by at least 1-1/2 inches.

I. Support ductwork in manner complying with SMACNA "HVAC Duct Construction Standards," hangers and supports sections. Where special hanging of ductwork is detailed or shown on Drawings, Drawings shall be followed. Angles shall be attached to overhead construction in a manner so as to allow a minimum of 2 inches of movement in all directions with no bending or sagging of the angle.

1. Except where modified in individual paragraphs of this Section, provide hanger support with minimum 18 gauge straps, 1 inch wide. Fold duct strap over at bottom of duct.
2. Install duct supports to rectangular ducts with sheet metal screws. Provide one screw at top of duct and one screw into strap at bottom of duct.

J. Installation of Flexible Ductwork:

1. Provide flexible ducts with supports at 30 inch centers with 2 inch wide, 26 gauge steel hanger collar attached to the structure with an approved duct hanger. Installation shall minimize sharp radius turns or offsets.

    a. Supports shall be in accordance with SMACNA HVAC Duct Construction Standards (Metal and Flexible).
    b. Flexible duct bends shall be not less than 1-1/2 duct diameter bend radius.

2. Make connections to rigid duct and units with Panduit style draw band at inner liner material, and a second draw band over the outer vapor barrier material.
3. Make connection to duct with spin-in fittings, with air scoop and balance damper.

K. Installation of Kitchen Exhaust Ducts (Type 1):

1. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease.
2. Slope duct a minimum of 2 percent to drain grease back to the hood.
3. Provide for thermal expansion of ductwork through 2000 ◦F temperature range.
4. Install listed grease duct access panel assemblies at each change of direction and at maximum intervals of 12 feet in horizontal ducts, and at every floor for vertical ducts, and as indicated on Drawings. Locate access panel on top or sides of duct. Locate panel so that edge of opening is not less than 1-1/2 inch from all outside edges of the duct or welded seams. For large horizontal ducts, install 20 inch by 20 inch access panel for personnel entry at maximum intervals of 20 feet.
5. Install listed grease duct access panel assemblies in accordance with the terms of their listings and the manufacturers' instructions. Access panels shall be labeled with the words: "Access Panel – Do Not Obstruct."
6. Fabricate ducts with continuous welds for grease-tight construction.
7. Grind welds to provide smooth surface free of burrs, sharp edges and weld splatter. When welding stainless steel with a No. 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to removed discoloration caused by welding.
8. Cover grease exhaust duct with two layers of 1-1/2 inch thick field-applied grease duct enclosure. Install grease duct enclosure in accordance with manufacturer's instructions and listing requirements.

L. Installation of Kitchen Exhaust Ducts (Type 2):

1. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease.
2. Slope duct a minimum of 1 percent to drain back to the hood or dishwasher connection.
3. Install duct access panel assemblies at each change of direction and at maximum intervals of 12 feet in horizontal ducts, and at every floor for vertical ducts, and as indicated on Drawings. Locate access panel on top or sides of duct. Locate panel so that edge of opening is not less than 1-1/2 inch from all outside edges of the duct. For large horizontal ducts, install 20 inch by 20 inch access panel for personnel entry at maximum intervals of 20 feet.
4. Fabricate ducts with continuous welds for water-tight construction.
5. Grind welds to provide smooth surface free of burrs, sharp edges and weld splatter. When welding stainless steel with a No. 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to removed discoloration caused by welding.
6. Fabricate ducts for dishwasher exhaust with seams on top of duct, and with minimum joints.
7. Access panels shall be labeled with the words: "Access Panel – Do Not Obstruct."

M. Installation of Shower Exhaust Ducts:

1. Slope duct a minimum of 1 percent to drain back to the exhaust grille.

3.12 PIPING INSTALLATION

A. General:

1. All piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.
2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.
3. Install piping to permit application of insulation and to allow valve servicing.
4. Where piping or conduit is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
5. Horizontal runs of pipes and conduits suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from the Architect.
6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.
7. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
8. Verify final equipment and fixture locations for roughing-in.
9. Where piping is installed in walls within one inch of the face of stud, provide a 16 gauge sheet metal shield plate on the face of the stud. The shield plate shall extend a minimum of 1-1/2 inches beyond the outside diameter of the pipe.
10. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.
11. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
12. Service Markers: Mark the location of each plugged or capped pipe with a 4 inch round by 30 inch long concrete marker, set flush with finish grade. Provide 2-1/2 inch diameter engraved brass plate as part of monument marker.
13. Pipe the discharge of each relief valve, air vent, backflow preventer, and similar device to floor sink or drain.

B. Sleeves:

1. Install Adjus-to-Crete, Pipeline Seal and Insulator, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations as directed shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.
2. At Contractor's option, Link-Seal, Metraflex Metraseal, or equal, casing seals may be used in lieu of caulking. Wrap pipes through slabs on grade with 1 inch thick fiberglass insulation to completely isolate the pipe from the concrete.

C. Floor, Wall, and Ceiling Plates:

1. Fit all pipes with or without insulation passing through walls, floors, or ceilings, and all hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.

D. Firestopping:

1. Pack the annular space between pipe sleeves and pipes penetrating floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.

    a. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.

2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators for each pipe penetration or fixture opening passing through floors, walls, partitions or floor/ceiling assemblies. All Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and in accordance with CBC requirements.
3. Sleeve penetrators shall have a built in anchor ring for waterproofing and anchoring into concrete pours or use the special fit cored hole penetrator for cored holes.
4. Copper and steel piping shall have SpecSeal, or equal, plugs on both sides of the penetrator to reduce noise and to provide waterproofing.
5. Firestopping systems to be installed in strict accordance with manufacturer's instructions.
6. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.

E. Flashing:

1. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
2. Refer to Division 07 specifications and Drawings details as applicable.
3. Flashing for penetrations of metal or membrane roof for pipes shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type.

    a. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
    b. Furnish and install counterflashing above each flashing required. Provide Stoneman, or equal, vandalproof top and flashing combination. Elmdor/Stoneman Model 1540.
4. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.

3.13 THERMAL AND SEISMIC EXPANSION LOOP INSTALLATION

A. Install expansion loops where piping crosses building expansion or seismic joints, between buildings, between buildings and canopies, and as indicated on Drawings.

B. Install expansion loops of sizes matching sizes of connected piping.

C. Install grooved-joint expansion joints to grooved-end steel piping.

D. Materials of construction and end fitting type shall be consistent with pipe material and type of gas or liquid conveyed by the piping system in which expansion loop is installed.

3.14 PIPE JOINTS AND CONNECTIONS

A. General:

1. Cutting: Cut pipe and tubing square, remove rough edges or burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt and debris from inside and outside of pipe before assembly.
3. Boss or saddle type fittings or mechanically extracted tube joints will not be allowed.

B. Copper Pipe and Tubing: All joints shall be brazed according to ASME Section IX, Welding and Brazing Qualifications, except pneumatic control piping, and hydronic piping having grooved-end fittings and couplings.

C. Flexible Connections:

1. Furnish and install Thermo Tech., Inc. F/J/R, Metraflex, or equal, flexible couplings with limiter bolts on piping connections to all equipment mounted on anti-vibration bases, except fan coil units under 2000 cfm, on each connection to each base mounted pump and where shown. Couplings shall be suitable for pressure and type of service.
2. Flexible connections in refrigerant lines; Flexonic, Anaconda or equal, metal hose, full size.
3. Anchor piping securely on the system side of each flexible connection.

3.15 HANGER AND SUPPORT INSTALLATION

A. General: Support ductwork, equipment and piping so that it is firmly held in place by approved iron hangers and supports, and special hangers. Hanger and support components shall support weight of ductwork, equipment and pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments or hangers, of same size as pipe or tubing on which used, or nearest available. Rigidly fasten hose faucets, fixture stops, compressed air outlets, and similar items to the building construction. The Architect shall approve hanger material before installation. Where building structural members do not match piping and ductwork support spacing, provide “bridging” support members firmly attached to building structural members in a fashion approved by the structural engineer.

1. Materials, design, and type numbers for support of piping per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.

a. Provide copper-plated or felt-lined hangers for use on uninsulated copper tubing.

2. Materials and design for ductwork support shall be per SMACNA “HVAC Duct Construction Standards, Metal and Flexible.”

B. Hanger components shall be provided by one manufacturer: B-Line, Grinnell, Unistrut, Badger, or equal.

C. Riser clamps: B-line model B3373, or equal.

D. Rubber Neoprene Pipe Isolators:

1. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Refer to Architectural Drawings for location of acoustical walls.
2. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. The rubber shall have between a 45 to 55 durometer rating and a minimum thickness of 1/2 inch.
3. Manufacturers:

a. Vertical runs: Acousto-Plumb or equal.
b. Horizontal runs: B-Line, Vibraclamp; Acousto-Plumb or equal.

E. Pipe Hanger and Support Placement and Spacing:

1. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.
2. Vertical piping hanger and support spacing: Provide riser clamps for piping, above each floor, in contact with the floor. Provide support at joints, branches, and horizontal offsets. Provide additional support for vertical piping, spaced at or within the following maximum limits:

Pipe Diameter	Steel Threaded or Welded (Note 3)	Copper Brazed or Soldered (Notes 3, 4)	CPVC & PVC (Note 2)
1/2 - 1”	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
1-1/4 - 2”	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
2-1/2 - 3”	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
Over 4”	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)

a. Note 1: Provide mid-story guides.
b. Note 2: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
c. Note 3: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
d. Note 4: Includes refrigerant piping, including vapor and hot gas pipes.

3. Horizontal piping, hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced at or within following maximum limits:

Pipe Diameter	Steel Threaded or Welded (Note 2)	Copper Brazed or Soldered (Notes 2, 3)	CPVC & PVC (Note 1)
1/2 - 1"	6 ft.	5 ft.	3 ft.
1-1/4 - 2"	7 ft.	6 ft.	4 ft.
2-1/2 - 3"	10 ft.	10 ft.	4 ft.
Over 4"	10 ft.	10 ft.	4 ft.

a. Note 1: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
b. Note 2: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
c. Note 3: Includes refrigerant piping, including vapor and hot gas pipes.

4. Suspended Piping:

a. Individually suspended piping: B-Line B3690 J-Hanger or B3100 Clevis, complete with threaded rod, or equal. All hangers on supply and return piping handling heating hot water or steam shall have a swing connector at point of support.

Pipe Size	Rod Size Diameter
2" and Smaller	3/8"
2-1/2" to 3-1/2"	1/2"
4" to 5"	5/8"

6"	3/4"

b. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.
c. Trapeze Suspension: B-Line, or equal, 1-5/8 inch width channel in accordance with manufacturers' published load ratings. No deflection to exceed 1/180 of a span.
d. Trapeze Supporting Rods: Shall have a safety factor of five; securely anchor to building structure.
e. Pipe Clamps and Straps: B-Line B2000, B2400, or equal. Where used for seismic support systems, provide B-Line B2400 series, or equal, pipe straps.
f. Concrete Inserts: B-line B22-I continuous insert or B2500 spot insert. Do not use actuated fasteners for support of overhead piping unless approved by Architect.
g. Steel Connectors: Beam clamps with retainers.

5. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.
6. Insulated Piping:

a. Do not interrupt insulation at pipe hangers and clamps.
b. Use thermal hanger shield inserts or MSS protection saddles and shields.
c. Thermal Hanger Shield Inserts:

1) Use thermal-hanger shield insert with clamp sized to match OD of insert.
2) Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
3) For below ambient services, maintain continuous vapor barrier.
4) For Clevis or Band Hangers: Install thermal-hanger shield inserts with insulation protection shields.
5) For Trapeze or Clamped Systems: Install thermal-hanger shield inserts with heavy-duty insulation protection shields. Install additional 180-degree galvanized shield for top of support if clamping is required.

d. MSS Protection Saddles and Shields:

1) MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
2) MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
3) Shield Dimensions for Pipe: Of length recommended in writing by manufacturer to prevent crushing insulation. Not less than the following:

a) NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
b) NPS 4: 12 inches long and 0.06 inch thick.
c) NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.

d) NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
e) NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

F. Piping Support to Structure:

1. Wood Structure: Provide and install wood blocking as required to suit structure. Provide lag screws or through bolts with length to suit requirements, and with size (diameter) to match the size of hanger rods required.

a. Do not install Lag screws in tension without written review and acceptance by Structural Engineer.

Side Beam Angle Clip	B-Line B3062--MSS Type 34
Side Beam Angle Clip	B-Line B3060
Ceiling Flange	B-Line B3199

b. Blocking for support of piping shall be not less than 2 inch thick for piping up to 2 inch size. Provide 3 inch blocking for piping up through 5 inch size, and 4 inch blocking for larger piping. Provide support for blocking in accordance with Structural Engineers requirements.

c. Where lag screws are used, length of screw shall be 1/2 inch less than the wood blocking. Pre-drill starter holes for each lag screw.

2. Steel Structure: Provide and install additional steel bracing as required to suit structure. Provide through bolts with length to suit requirements of the structural components. Burning or welding on any structural member may only be done if approved by the Architect.

G. Duct Hanger and Support Spacing: Conform to Requirements of CMC and SMACNA “HVAC Duct Construction Standards, Metal and Flexible.”

H. Duct Support to Structure:

1. Upper connection of support to wood structure shall be with wood screws or lag screws in shear fastened in the upper one half of the wood structural member. Fasteners shall conform to the following schedule:

For ducts with P/2=30"	#10 x 1-1/2" wood screw
For ducts with P/2=72"	1/4"x 1-1/2" lag screw
For ducts with P/2 over 73"	3/8"x 1-1/2" lag screw

2. Upper connection in tension to wood shall not be used unless absolutely necessary. Where deemed necessary the contractor shall submit calculations to

show the size fastener and penetration required to support loads in tension from wood in accordance with the following schedule:

For ducts with P/2=30"	260 pounds per hanger
For ducts with P/2=72"	320 pounds per hanger
For ducts with P/2=96"	460 pounds per hanger
For duct with P/2 larger than 120"	NOT ALLOWED

3. Install concrete inserts for support of ductwork in coordination with formwork as required to avoid delays in work.
4. Upper connection to manufactured truss construction must comply with truss manufacturers published requirements and Structural Engineers requirements.

3.16 INSULATION AND FIELD-APPLIED JACKET INSTALLATION

A. General:

1. The term "piping" used herein includes pipe, air separators, valves, strainers and fittings.
2. Clean thoroughly, test and have approved, all piping and equipment before installing insulation and/or covering.
3. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, ductwork, and equipment.
4. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment as specified in insulation system schedules.
5. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
6. Install insulation with longitudinal seams at top and bottom of horizontal runs.
7. Install multiple layers of insulation with longitudinal and end seams staggered.
8. Keep insulation materials dry during application and finishing.
9. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
10. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
11. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
12. For piping, ductwork, and equipment, with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.
13. Repair all damage to existing pipe, duct and equipment insulation whether or not caused during the work of this contract, to match existing adjacent insulation for

thickness and finish, but conforming to flame spread and smoke ratings specified above.

14. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

    a. Install insulation continuously through hangers and around anchor attachments.
    b. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
    c. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
    d. Cover inserts with jacket material matching adjacent insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

B. Piping Insulation Installation:

1. General:

    a. Apply insulating cement to fittings, valves and strainers and trowel smooth to the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to the bonnet. Leave strainer cleanout plugs accessible.
    b. Provide removable insulation covers for items requiring periodic service or inspection.
    c. Insulation shall be vapor tight before applying PVC jacket and fitting covers. Verify suitability with manufacturer of insulation.
    d. Provide pre-formed PVC valve and fitting covers for indoor piping.
    e. Provide factory-fabricated aluminum valve and fitting covers for outdoor piping.
    f. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.

2. Below-Ambient Services Including Chilled Water Supply and Return and Refrigerant Piping:

    a. Insulate valves and irregular surfaces to match adjacent insulation and cover with two layers of woven glass fiber cloth saturated in Foster Sealfas 30-36, 3M, or equal, extending 3 inches over the adjoining pipe insulation. Finish with a coat of Foster Sealfas 30-36, 3M, or equal. The 3 inch wide SSL end laps furnished with the insulation shall be adhered over the end joints. Seal entire surface of insulation vapor tight, including joints and ends of PVC or aluminum fitting covers.
    b. Variable refrigerant flow (VRF) heat pump systems: Insulation for VRF system refrigerant piping shall be installed according to VRF unit manufacturer’s instructions.

3. PVC Jacket Installation:

    a. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

        1) Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

4. Aluminum Jacket Installation:

    a. Where insulated piping is exposed to the weather apply aluminum jacket secured with 1/2 inch stainless-steel bands on 12 inch centers. Install jacketing with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Cover fittings with glass cloth, two coats of Foster Sealfas 30-36, and factory-fabricated aluminum fitting covers, of same material, finish, and thickness as jacket. Insulation shall be vapor tight before applying metal jacket and fitting covers.

    b. Do not install aluminum jackets on refrigerant flexible connectors to vibration isolated outdoor condensing units. Coat elastomeric insulation with insulation manufacturer’s recommended ultraviolet light protective coating.

C. Duct Insulation Installation:

1. General:

    a. Insulation applied to the exterior surface of ducts located in buildings shall have a flame spread of not more than 25 and a smoke-developed rating of not more than 50 when tested as a composite installation including insulation, facing materials, tapes and adhesives as normally applied. Material exposed within ducts or plenum shall have a flame-spread rating of not more than 25 and a smoke-developed rating of not more than 50.
    b. Duct insulation applied to the exterior surface of ducts installed outside the building insulation envelope shall meet minimum R-value of R-8 at 3 inches thickness and 3/4 pound per cubic foot density.
    c. Duct insulation applied to the exterior surface of ducts installed within the building insulation envelope shall meet minimum R-value of R-4.2 at 1-1/2 inches thickness and 3/4 pound per cubic foot density.

2. Mineral Fiber Blanket Installation:

    a. Insulate all unlined concealed supply and return ducts with fiberglass duct wrap, manufactured as a blanket of glass fibers factory laminated to a reinforced foil/kraft vapor retarding facing. Provide 2 inch stapling and taping flange. Wrap insulation entirely around duct and secure with outward clinching staples on 6 inch centers. Provide mechanical fasteners at maximum 18 inch centers for all bottoms of duct which are greater than 24

inches. Lap all insulation joints 3" minimum. Insulate ducts installed tight against other work before hanging in place. Seal all seams, both longitudinal and transverse, and all staple and mechanical fastener penetrations of facing with scrim backed foil tape or recommended sealant, to provide a vapor tight installation.

3. PVC Jacket Installation:

a. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1) Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.17 TEMPERATURE CONTROL SYSTEM INSTALLATION

A. Provide thermostats where indicated on drawings. All wiring shall be in conduit. Provide all relays, transformers and the like to render the control system complete and fully operable. All control conduit to be rigid steel type.

3.18 EQUIPMENT START-UP

A. Initial start-up of the systems and pumps shall be under the direct supervision of the Contractor.

B. Equipment start-up shall not be performed until the piping systems have been flushed and treated and the initial water flow balance has been completed.

C. It shall be the responsibility of the Contractor to assemble and supervise a start-up team consisting of controls contractor, start-up technician, and test and balance contractor; all to work in concert to assure that the systems are started, balanced, and operate in accordance with the design.

D. After start-up is complete, instruct the Owner's personnel in the operation and maintenance of the systems. Obtain from the Owner's representative a signed memo certifying that instruction has been received.

E. For additional requirements, refer to article, Check, Test and Start Requirements, in Section 23 00 50, Basic HVAC Materials and Methods.

3.19 TESTING AND BALANCING

A. For testing and balancing requirements, refer to Section 23 05 93, Testing and Balancing for HVAC.

3.20 CLEANING AND PROTECTION

A. As each duct section is installed, clean interior of ductwork of dust and debris. Clean external surfaces of foreign substances that might cause corrosive deterioration of metal or where ductwork is to be painted.

B. Strip protective paper from stainless steel ductwork surfaces, and repair finish wherever it has been damaged.

C. Temporary Closure: At ends of ducts that are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering that will prevent entrance of dust and debris until connections are to be completed.

D. As each internally lined duct section is installed, check internal lining for small cuts, tears, or abrasions. Repair all damage with fire retardant adhesive.

3.21 EQUIPMENT MOUNTING

A. Mount and anchor equipment in strict compliance with Drawings details. Alternate anchorage methods will not be considered for roof mounted equipment.

3.22 INDOOR PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping, Cooling-Only Systems:

1. Suction and hot-gas piping smaller than 1-1/2 inches diameter:

    a. Flexible Elastomeric: 1/2 inch thick.
    b. Mineral-Fiber, Preformed Pipe: 1/2 inch thick.

2. Suction piping 1-1/2 inches diameter and larger:

    a. Flexible Elastomeric: 1 inch thick.
    b. Mineral-Fiber, Preformed Pipe: 1 inch thick.

B. Refrigerant Vapor and Liquid Piping, Heat Pump Systems:

1. Vapor piping for heat pump applications smaller than 1-1/2 inches diameter:

    a. Flexible Elastomeric: 1-1/2 inches thick.
    b. Mineral-Fiber, Preformed Pipe: 1-1/2 inches thick.

2. Vapor piping for heat pump applications 1-1/2 inches diameter and larger:

    a. Flexible Elastomeric: 2 inches thick.
    b. Mineral-Fiber, Preformed Pipe: 2 inches thick.

3. Liquid piping for heat pump applications smaller than 1 inch diameter:

a. Flexible Elastomeric: 1 inch thick.
b. Mineral-Fiber, Preformed Pipe: 1 inch thick.

4. Liquid piping for heat pump applications 1 inch diameter and larger:

a. Flexible Elastomeric: 1-1/2 inch thick.
b. Mineral-Fiber, Preformed Pipe: 1-1/2 inch thick.

3.23 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping, Cooling-Only Systems:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Flexible Elastomeric: 1 inch thick.
b. Mineral-Fiber, Preformed Pipe: 1 inch thick.

B. Refrigerant Vapor and Liquid Piping, Heat Pump Systems:

1. Vapor piping for heat pump applications smaller than 1-1/2 inches diameter:

a. Flexible Elastomeric: 1-1/2 inches thick.
b. Mineral-Fiber, Preformed Pipe: 1-1/2 inches thick.

2. Vapor piping for heat pump applications 1-1/2 inches diameter and larger:

a. Flexible Elastomeric: 2 inches thick.
b. Mineral-Fiber, Preformed Pipe: 2 inches thick.

3. Liquid piping for heat pump applications smaller than 1 inch diameter:

a. Flexible Elastomeric: 1 inch thick.
b. Mineral-Fiber, Preformed Pipe: 1 inch thick.

4. Liquid piping for heat pump applications 1 inch diameter and larger:

a. Flexible Elastomeric: 1-1/2 inch thick.
b. Mineral-Fiber, Preformed Pipe: 1-1/2 inch thick.

C. Refrigerant Flexible Connectors:

1. Flexible Elastomeric: Thicknesses as specified for rigid piping.

3.24 INDOOR FIELD-APPLIED PIPING JACKET SCHEDULE

A. Piping, concealed: None.

B. Piping, exposed: PVC, 20 mils thick.

3.25 OUTDOOR FIELD-APPLIED PIPING JACKET SCHEDULE

A. All Piping: Aluminum, Stucco Embossed: Thickness as follows:

Outer Insulation Diameter (Inches)	Minimum Aluminum Jacket Thickness (Inch)	
	Rigid Insulation	Non-Rigid Insulation (1)
8 and Smaller	0.024	0.024
Larger Than 8 Thru 11	0.024	0.024
Larger Than 11 Thru 24	0.024	0.024
Larger Than 24 Thru 36	0.024	0.032
Larger Than 36	0.024	0.040

(1) Non-rigid Insulation is defined as having a compressive strength of less than 15 psi.

3.26 INDOOR DUCT INSULATION SCHEDULE

A. Ducts Located Within Building Thermal Envelope:

1. Minimum R-Value = R-4.2.
2. Supply and Return Ducts: Mineral Fiber Blanket, 1-1/2 inches thick, 0.75 lb/cu. ft.

B. Ducts Located Within Building Outside Thermal Envelope:

1. Minimum R-Value – R-8.0.
2. Supply and Return Ducts: Mineral Fiber Blanket, 3 inches thick, 0.75 lb/cu. ft.

3.27 OUTDOOR DUCT INSULATION SCHDULE.

A. Minimum R-Value = R-8.

B. Refer to article, Ductwork, for internal duct lining. Provide 2 inches thick internal duct lining where indicated on Drawings.

3.28 INDOOR FIELD-APPLIED DUCT JACKET SCHEDULE

A. Insulated ducts in concealed spaces: None.

B. Insulated ducts in exposed unconditioned spaces: PVC, 20 mils thick.

END OF SECTION 23 80 00

SECTION 26 01 10 - ELECTRICAL GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 CONTRACT PROVISIONS

A. The requirements of this Section are in addition to the requirements of Division 1, General Conditions and Supplementary Conditions.

1.2 SUMMARY

A. This section describes the requirements for the electrical work includes, among others, the furnishing and installation of the following:

1. New electrical service, including transformer, conduit and trenching, conductors.
2. Power distribution system.
3. Grounding system.
4. Lighting and lighting control systems.
5. Wiring systems including power wiring to plumbing and HVAC and other misc. appliances and equipments.
6. Voice and data systems, empty boxes and raceway.
7. Emergency egress lighting.
8. Testing and commissioning.
9. The requirements of this Section are in addition to the requirements of Division 1, General Conditions and Supplementary Conditions.

B. Furnish and install all electrical equipment and systems as shown on the Drawings and as described in this Division of the Specifications to provide a complete and functional electrical installation. This work includes but is not limited to all material and labor required for installation of electrical and special systems complete as described herein this specification and drawings; and connections (and installation where not otherwise provided for) of electrical equipment furnished by others. Provide and install all items of equipment, devices, supports, etc., which are incidental to the major components shown on the Drawings or described in these Specifications.

C. RELATED WORK INCLUDED IN OTHER DIVISIONS

1. Finish painting except factory applied finishes and repair of factory finishes shall be provided in accordance with appropriate sections of this Specification. Coordinate "painting" requirements of this Division with other trades as required to assure timely and satisfactory completion of required work. In finished areas, all exposed raceway, boxes,

galvanized steel box covers (where allowed), and other electrical "structure" shall be finished to match adjacent structures. Verify that all raceway openings are closed and box covers are in place prior to finishing work done by others.

2. Examine the drawings and specification for mechanical equipments and provide electrical installation for heating, ventilation and air conditioning equipment, motors, pumps and associated motor starters and controls as described in Division 23.

3. Examine the Architectural drawings and specification for electrical appliances and equipment which may not be shown on the plans to include and provide electrical installations as described in the architectural division of work.

4. Examine the Architectural drawings and provide all construction necessary to maintain the integrity of the fire rated barriers.

5. Examine the Architectural drawings and coordinate with the Architect to provide access doors, whether shown on drawings or not, where floors, walls, or ceiling must be penetrated for access to electrical equipment, outlet boxes, devices, etc., and as specified in this specification.

6. Provide and install, as part of the work described in this Division, all power and control wiring fed from a source of 30 Volts or more (i.e. all wiring except temperature control wiring) for mechanical equipment described in Division 23.

7. Examine the fire sprinkler system drawings and specificatioins for electrical work which may not be shown on the electrical and/or fire detection and alarm plans to be included in the electrical work as necessary as described in the Division 21 fire sprinkler system.

8. Examine the food service consultant drawings and specifications for electrical work which may be shown on the electrical plans to be included in the electrical work as necessary as described in the food service consultant plans and specifications.

9. Examine the security consultant drawings and specifications for electrical work which may be shown on the electrical plans to be included in the electrical work as necessary as described in the security consultant plans and specifications.

10. Examine the technology consultant drawings and specifications for electrical work which may be shown on the electrical plans to be included in the electrical work as necessary as described in the technology consultant plans and specifications.

11. Examine the fire alarm design-build drawings and specifications for electrical work which may be shown on the electrical plans to be included in the electrical work as necessary as described in the fire alarm design-build plans and specifications.

1.3 APPLICATION OF OTHER DIVISIONS

A. Where carpentry, masonry, concrete work, painting, etc., is required in the installation of equipment specified under this Division, the work shall be done in accordance with the applicable Division of these Specifications. This work could include for example: work associated with panelboard installation, equipment pads or bases, support structures, etc.

1.4 DRAWINGS AND SPECIFICATIONS

A. The information presented in these Specifications and on the Drawings is intended to describe the utilitarian and physical aspects of the systems shown as well as the quality of the entire installation. All information is as complete and thorough as possible, but every condition or situation cannot be anticipated. Exact locations, dimensions, elevations, etc. must be determined "on the job" with careful attention to the "intent" of the Drawings and Specifications.

B. The above paragraph shall not be construed as to allow significant deviation from either the Drawings or Specifications without prior approval of the Architect, but minor changes in conduit routing or equipment locations may be required or desired due to specific conditions encountered. This work shall be accomplished in accordance with these Specifications and no "extra charges" are to be created for any unanticipated labor or material.

C. Any error or omissions of detail in either the drawings or the specifications shall not relieve the Contractor from correctly installing all materials necessary for complete and operating electrical systems.

D. Contractor shall inspect the site and verify all measurements and conditions. No extra compensation will be allowed because of differences between work shown on the drawings and measurements at the site.

1. The Drawings are diagrammatic in nature, but the locations of devices, equipment, outlets, and lighting fixtures are shown approximately where installations are intended. Architectural, structural, mechanical, and other drawings shall be examined, noting all conditions that may affect this work. Report conflicting conditions to the Architect/Engineer for adjustment before proceeding with the work. Should the Contractor proceed with work without reporting the matter, he does so on his own responsibility and shall alter work if directed by the Architect/Engineer at his own expense.

E. Examine the architectural, structural, mechanical, fire sprinkler, security, technology, fire alarm, food service and manufacturer's drawings for various equipment in order to determine exact routing and final terminations for all conduits and cables. Conduits shall be stubbed up as near as possible to equipment enclosure.

F. Where conduits can not be run concealed in wall and/or ceiling space, the Constractor shall coordinate with the architectural and structural plans and the Architect for installing and routing of exposed conduits.

G. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The Owner reserves the right to require minor changes in location of outlets or equipment, prior to rough in without incurring any additional cost or changes.

H. If significant departures from the Drawings or Specifications are considered necessary by the Contractor, details of the changes and the reasons therefore shall be submitted to the Architect as within thirty days after award of contract. Prior written acceptance of the Architect is required for these departures.

I. Clarification of plans and specifications for the purpose of facilitating construction, but not involving additional labor and materials, may be prepared during construction by the Architect/Engineer. Said revised plans and specifications shall become a part of the contract. The Contractor shall conform to the revised plans and specifications at no additional cost to the District.

J. Where existing underground or otherwise concealed facilities are indicated on the Drawings, these are located as well as can be determined from available information. The Contractor is required to verify actual locations as necessary for this construction.

K. CODES, STANDARDS, RULES AND REGULATIONS

1. All work and materials shall be in full accordance with the latest rules, codes, and/or regulations and not limited to the following:

2. NFPA 101 - Life Safety Code - 2022

3. Title 24 - State of California Administrative Code - 2022 (Applicable for Category B classification)

4. California Electrical Code (CEC) - 2022

5. California Building Code (CBC) - 2022

6. City or County Electrical Code as applicable.

7. Utility rules and regulations.

8. Any applicable additional codes and regulatory documents effective at the project site.

L. Nothing on the Drawings or in the Specifications shall be construed to allow work not in conformance with these rules, codes, and regulations.

1. The Drawings and/or Specifications shall take precedence where work and material described therein exceeds that required by rules, codes, or regulations.

1.5 MANUFACTURER'S INSTRUCTIONS

A. Follow the manufacturer's instructions when specific installation or connection details are not indicated or specified on the contract documents.

B. Notify the Architect/Engineer of conflicts between the manufacturer's instructions and installation or connection details prior to the installation of materials.

1.6 WORKMANSHIP

A. High quality workmanship shall be evidenced in the installation of all electrical equipment and materials. Use the National Electrical Contractors Association's "Standard of Installation" as a guide to the workmanship required. Be prepared to replace or repair any material or equipment damaged by or installed in a manner exhibiting evidence of poor workmanship.

1.7 COORDINATION WITH OTHER TRADES

A. Examine the Electrical Drawings and refer to the Drawings and Specifications describing other work to be accomplished. Verify and coordinate prior to bid. Continue to coordinate work planning and all work in the field to avoid conflicts, errors, and/or delays. No compensation will be allowed for extra work necessitated by lack of coordination.

1.8 AUTHORITY OF THE ARCHITECT

A. As used in this paragraph only, the word "Architect" shall mean the Architect of record or his designated representative.

B. The authority of the Architect shall be absolute with respect to all performance under this Specification. In case of dispute, the decision of the Architect shall be final.

C. Where optional materials, methods, or installation techniques are allowed under the provisions of this Specification, they may be used at the discretion of the Architect. The Architect may require specific materials, methods, or techniques to be used in specific situations where use of other materials, methods, or techniques might in his judgment result in loss of aesthetics, accidental damage, life safety hazard, or loss of utility over the system design lifetime.

D. No additional charges will be allowed for work or material require to be supplied under the conditions of this paragraph unless the need for such material or work could not have been anticipated by thorough study of the site, Drawings, and Specifications and knowledge of all applicable codes, laws, and ordinances.

1.9 EXAMINATION OF THE SITE

A. The contractor is required to visit the site of construction prior to bid to determine existing conditions and their effect upon the work he will be required to perform. No additional compensation will be allowed for any extra expenses incurred by failure to detect and

evaluate all existing conditions that will affect his work to be included in the bid to accomplish this contract document's goal.

1.10 STRUCTURAL REQUIREMENTS:

A. Secure all anchors for electrical equipment in a manner, which will not decrease the structural value of any structure to an unsafe level. Install all equipment, fixtures, and etc. to resist seismic movements. Inform the Architect in advance and provide drawings of any proposed modifications to the structure that involves cutting or patching of concrete, masonry, steel, or wood in this project.

1.11 PERMITS, FEES, AND, INSPECTIONS

A. Obtain all permits and licenses as required and pay all fees incidental to construction.

B. Inspections required by prevailing Local Authorities, and/or ordinances, shall be coordinated and arranged by the contractor. Provide the Architect with a schedule of inspections, where applicable, and submit all certificates of inspection to the Architect.

C. The Contractor shall cooperate with the Architect and shall provide assistance at all times for the inspection of the electrical work. Remove covers, operate equipment, or perform any reasonable work, which, in the opinion of the Architect, will be necessary to determine the quality or adequacy of the work. Work shall not be closed in or covered before inspection and approval by the Architect. Cost of uncovering and making repairs where un-inspected work has been closed in shall be borne by the Contractor. If any material does not conform with these specifications the Contractor shall, within three days after being notified by the Architect, remove the materials from the premises.

1.12 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials and equipment to project site in manufacturer's original packaging with labeling showing product name, brand, model, project name, address, and Contractor's name. Store in a location as agreeable to District. Secure material from weather or accidental damage.

1.13 OPERATING INSTRUCTIONS

A. Instruct the District as to function, operation, maintenance, and adjustment of each system and piece of equipment provided.

1.14 RECORD DRAWING

A. The Contractor shall keep a separate set of Electrical Drawings at the job site to be used as RECORD Drawings. These Drawings are to be kept current and in a neat and clean condition at all times. They are to be available for inspection by the Architect or Engineer at any time during site visitations. These Drawings shall be "red lined" to indicate all changes in equipment, device, and outlet locations; and to indicate the true locations of all concealed or

underground work where different from that shown on the Drawings. Each sheet of this set shall be clearly and permanently marked "RECORD DRAWINGS".

B. Upon completion of the project and prior to final payment, transfer all RECORD DRAWINGS information to the provided original drawings. All information shall be clearly drawn with “RED” ink. The drawings shall be scanned, 100% edited, and converted into an AutoCAD “.dwg” version 2002 (or higher) electronic file. Deliver the original, final sets, and electronic files (CD) to the Architect for review and delivery to the District/Owner.

1.15 GUARANTEE

A. All electrical work, material, and equipment shall be guaranteed to be free from defects in workmanship or material for a period of two (2) year from the date of final acceptance. Repair or replace all such defects in a timely manner and any damage to the owner's property resulting from such defect or repair thereof. All equipment and material provided and all work accomplished under the requirements of this section shall be at no expense to the District.

1.16 MAINTENANCE AND SERVICE

A. Maintenance and service shall be provided as part of the Contract during the two year warranty period starting the day that Project Completion is awarded by the County Representative.

1. Contractor shall be responsible for systems and system components as defined in these documents.

2. Scheduled maintenance shall be conducted on a weekly and quarterly basis. Responsibilities for scheduled maintenance are as follows:

a. Weekly - County’s personnel.

b. Quarterly - Contractor’s personnel.

3. All maintenance activity shall be conducted on a schedule that is convenient to the County Representative. All Contractors personnel shall provide written notice of all visits.

B. Daily operational inspections by County shall consist of inspections to determine the operational state of a system. It is not intended that the County perform adjustments or modifications for system restoration.

C. Non-scheduled maintenance will be initiated by staff personnel as a result of daily inspections or operational use of the systems. Categories of maintenance support and the response time for system restoration are defined as follows:

1. Critical - Items which compromise the security of the facility or have an adverse effect on the operations of the facility. Items in this category shall be returned to service within

eight (8) actual hours after receipt of a service call. Service shall be available on a seven (7) day, twenty-four (24) hour basis.

2. Sensitive - Items which adversely impact the operations of the facility but are not considered “critical” as defined above. Items in this category shall be returned to service within forty eight (48) actual hours after receipt of a service call. Service shall be available on a normal eight (8) hour, five (5) day a week basis.

3. Normal - Items which require maintenance support but are not “critical” or “sensitive” as defined above. These are typically items which staff personnel identify and accept that maintenance during the standard quarterly inspection.

D. Contractor shall provide scheduled maintenance in accordance with the description of services and maintenance schedule.

E. Contractor shall maintain all documents and modify drawings, schedules, and other documents as required to effect documentation which reflects the current system or wiring configuration.

F. Upon termination of the service contract, Contractor shall return all system documents to the County Representative.

G. Contractor shall develop maintenance reports, or logs, which identify maintenance activities on the system. If requested, the reports, or logs, shall be provided to the County Representative on a monthly basis.

H. In the event software is introduced which will enhance the system operation, Contractor shall inform the County Representative of the software, its features, and the cost to upgrade the existing software. If accepted by the County Representative, Contractor shall furnish and install the software and invoice County in the amount approved by the County Representative. Contractor to train the County staff on new system features or software which may be provided to enhance the systems capability.

I. Insurance requirements shall be maintained through the maintenance and service period.

1.17 SPARE PARTS

A. Spare parts shall be provided and maintained by Contractor to support the maintenance response requirements defined in this document.

B. The spare parts inventory may be comprised of Contractor furnished, Contractor maintained parts.

C. Contractor shall maintain a spare parts inventory as he deems necessary to support the maintenance and service requirements of this section.

D. During the maintenance and service period, Contractor shall maintain a log of all component failures and parts replaced.

E. Six months prior to the expiration of the maintenance and service period, Contractor shall submit the replaced parts log to the County Representative. The County Representative will use the replaced parts log to evaluate the on-site spare parts inventory required for future maintenance by the County.

F. At a minimum, the following spare parts shall be stored at the site in a location identified by the County Representative. The spare parts shall be property of the County. This requirement is not intended to include all spare parts required to meet the service response time limits. The contractor shall replace any of these spare parts, if used for service work during the warrantee period within 10 days. The spare parts shall be the same type submitted and installed in the facility.

1. Lighting fixture driver.
2. Branch panelboard circuit breakers.
3. Fuses.
4. Lighting occupancy sensors and switches.

1.18 QUALITY ASSURANCE

A. Pre-Installation Meetings:

1. Conduct pre-installation meeting prior to rough-in in accordance with Division 01 for all work related to Data rooms (MDF, IDF), Security rooms and Central Control room.
2. Convene pre-installation meeting prior to commencing work of Division 26 sections.
3. Coordinate work in this Section with work in related Sections.

PART 2 PRODUCTS

2.1 MATERIALS

A. Unless specifically indicated otherwise, all material shall be new and free from defects; it shall be listed by Underwriters' Laboratories where applicable. Like items shall be of the same manufacturer (except lighting fixtures - which shall be as specified).

B. Except as noted otherwise, where material of a particular manufacturer is specified, the intent is to describe the quality and function of the item. The term "...equal or acceptable equal" is implied. A substitution of any of these items will require that the item be presented in a submittal whether specifically listed in the "Submittals" paragraph below or not.

2.2 SUBMITTALS

A. Material submittals shall be complete and submitted all at the same time. The individual groups of submittal types (e.g.: lighting fixtures, wiring devices, distribution equipment, etc.) MUST be prefaced with a list of contents identifying each item by it's project name or

symbol, manufacturer, and complete catalog number. Each copy of each submittal group shall have the list of contents attached. These lists will be used to report submittal comments. The Contractor is responsible for submitting this information in a timely manner so that material may be ordered early enough to meet the construction schedule. If material is not ordered in time for whatever reason, pay such premium prices and special handling charges as are required to meet the construction schedule. No substitution of an "accepted" item will be allowed due to failure to plan for adequate material procurement lead time.

B. Shop drawings

1. Submit shop drawings grouped to include complete submittals of related systems, products, and accessories in a single submittal.

2. Submit a composite drawing for each cell chase, including the coordinated layout of all other trades' distinct components and detailing the intended electrical installation.

3. Shop drawings shall be drawn to scale or completely dimensioned and shall give all information required to completely describe the item. The Contractor shall carefully check all the shop drawings for compliance with these specifications and the Plans.

4. Corrections or comments made on the shop drawings during review do not relieve the Contractor from compliance with requirements of the drawings and specifications. Shop drawing checking by the Engineer is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for:

   a. Confirming and correlating all quantities and dimensions.

   b. Selecting fabrication processes and techniques of construction.

   c. Coordinating his work with all other trades.

   d. Performing his work in a safe and satisfactory manner.

   e. Provide equipment that can be installed in the available space with all code clearances. This shall be coordinated prior to ordering any equipment.

C. Work requiring shop drawings shall not be started before receipt of the Architect's review and acceptance.

D. The Architect's/Engineer's review of the submitted materials, items and shop drawings are for general compliance with the plans and specifications and general design and arrangement only. Therefore, it shall not relieve the Contractor from responsibility for errors of any sort in the materials, items, shop drawings or schedules. The Contractor shall verify all dimensions and job site conditions affecting the work, and shall be responsible for furnishing and installing the proper materials required by the Contract, whether or not indicated on the drawings and specifications.

E. As a minimum, submittals are required for the following items:

1. RACEWAY COMPONENTS
2. WIRE AND CABLE
3. WIRING DEVICES
4. SWITCHBOARD
5. DISTRIBUTION PANELS
6. PANELBOARDS
7. PULL BOXES
8. SAFETY SWITCHES, DISCONNECTS AND CIRCUIT BREAKERS
9. TRANSFORMERS
10. LIGHTING FIXTURES, CONTROL SYSTEMS, PEDESTALS AND POLES
11. TERMINAL CABINETS
12. GENERATOR
13. AUTOMATIC TRANSFER SWITCH

F. Samples

1. Submit as directed by the architect and as required in each specification section.

2.3 SUBSTITUTIONS

A. Specific brand names and catalog numbers are used to describe materials in order to establish of performance and quality.

B. Only one substitution will be considered for any item. Substitute materials must be equal in quality and function to that specified. Allowance of a substitution does not permit any reduction of system performance or utility, and the Contractor is responsible for additional costs incurred due to use of a substituted item. If the proposed substitute item is "rejected", the specified item shall be provided (re-submittal required) without further discussions or delay.

C. Any Contractor's proposed substitution of material, article, or method in the opinion of the Architect/Engineer are equal to that specified will be accepted, provided the Contractor submits a single written requests, in triplicate, to the Architect, with the following information for each item:

D. Name of Manufacturer or supplier.

E. Trade or brand names.

F. Type, model, style, and/or catalog number.

1. Size or capacity rating.

G. After receipt of a written request from the contractor, the engineer of record will review product substitutions fourteen (14) days prior to the bid date. If system substitutions are submitted after the award of the project contract, the analysis for the whole system substitution will be charged to the contractor at senior engineer hourly rates.

H. The decision of the Architect/Engineer shall govern as to what is equal to the item specified in the plans and specifications. Equality will be judge on the basis of the following:

1. Conformance with description or performance required.

2. Equal in quality.

3. Comparable in appearance and artistic effect where these are in considerations.

4. Comparable operation, maintenance and performance.

5. Equal in longevity and service under conditions of climate and usage.

6. Conformance with space allocations and requirements for operations from in details and construction of related work.

7. Conformance with al applicable codes and regulations.

I. If the Architect/Engineer considers it necessary, tests to determine the quality of the proposed materials shall be made, at the expense of the Contractor, by an unbiased laboratory, satisfactory to the Architect.

2.4 HOUSEKEEPING PADS AND FOUNDATIONS

A. Concrete work required for housekeeping pads and foundations shall be provided by General Construction Work.

B. Furnish required dimensional drawings and specify locations. Minimum height of housekeeping pads shall be 4 inches and shall extend out 6 inches from the footprint of the equipment.

C. Furnish anchor bolts and sleeves, and verify accuracy of installation.

D. Provide for:

1. Outdoor Switchboards.

2. Diesel generator.

3. Outdoor distribution panels.

4. Outdoor floor mounted transformers.

5. Other items as required.

2.5 ENCLOSURES

A. Provide enclosures suitable for the specific type of location in which they are installed.

1. Provide NEMA 1 or NEMA 12 boxes and enclosures for dry locations. Dry locations are all indoor areas that do not fall within the definitions below for wet or damp locations.

2. Provide NEMA 3R boxes and enclosures for wet locations. Wet locations are all locations exposed to weather, whether under a roof or not.

3. Provide NEMA 4 boxes and enclosures for damp locations. Damp locations are all indoor spaces wholly or partially underground or any area subject to water spray.

PART 3 EXECUTION

3.1 INSTALLATION

A. All equipment shall be set square and plumb, securely mounted, adequately supported, and permanent. Provide workspace around items of electrical equipment as required by California Electrical Code (CEC). In general, equipment is to be installed in accordance with manufacturer's instructions; but the requirements of these specifications shall take precedence where conflicts exist.

B. WIRING METHODS: The cables and conductors of all systems specified in the Specification are required to be installed in raceway.

3.2 ELECTRICAL WORK FOR EQUIPMENT PROVIDED UNDER OTHER SECTIONS

A. Install power conductors and terminate on equipment provided under other specification sections. Verify specific requirements.

B. Install and terminate electrical controls as described on the Electrical Drawings (For mechanical equipment specified in Division 23).

C. Line voltage control wiring of exhaust fans is to be accomplished under this Division. The controlling device may be specified elsewhere.

D. Provide and install all disconnect/safety switches and motor starters except those devices specified to be furnished with equipment specified elsewhere.

E. Unless provided for in another Division, install all items of electrical equipment provided by others.

F. Assist others in equipment testing to verify that wiring and connections made under this Division are correct.

3.3 EQUIPMENT IDENTIFICATION

A. Nameplates shall be installed on all items of electrical equipment as follows: switchboard(s) and switchboard circuit breakers, panelboards, terminal cabinets, time switches, contactors, motor control switches, wall switches (where noted on the Drawings), motor starters provided under this Division where the function is not immediately obvious, and safety switches.

B. The nameplate shall identify the item by Drawing name where applicable and describe its use or function in this installation.

C. Permanently mark all utility outlets to show source of power panel and circuit breaker number.

3.4 EXCAVATION AND BACKFILL

A. Excavation and backfill shall be accomplished as required for installation of electrical equipment as shown on the Drawings. Restore all surfaces, roadways, walks, etc., and any existing underground structures which might be disturbed during this work to their original condition in a manner acceptable to the Architect.

B. Trenches shall be straight except where otherwise indicated. Depth shall be as noted on the Drawings and at least as required to provide the minimum cover specified by applicable codes and regulations for the equipment installed. Bottom of trench shall be smooth and free of any rock points. Place a 4" sand bed in trench if these conditions cannot be met with native material.

C. Backfill shall be clean and free of rocks and debris. Backfill is to be tamped in 6" layers to nominal 95% compaction using a mechanical tamper manufactured specifically for this purpose. In an area of engineered fill or other area of specified compaction, backfill shall be compacted to match that specified for that area.

D. At a depth of 12" below finished grade and at least 6" above installed equipment, lay a 6" wide yellow warning tape on the compacted backfill for the full length of the trench. Do not stretch the tape. Use Brady "Identoline" stating: "CAUTION BURIED ELECTRICAL LINE". Installation under building slabs is not required unless noted otherwise.

E. If at any time during a period of one year dating from the date of final acceptance of the project, there shall be any settlement of conduit trenches, the Architect may notify the Contractor to immediately provide additional fill and to make such repairs or replacements in paving, planting, or structures, as may be deemed necessary at the Contractor's expense

F. Cooperate and coordinate with others in planning for and execution of all trench work.

1. The Contractor is expected to exercise due care when excavating in an area of existing utilities to avoid damage to these facilities. Where it can be determined that underground facilities are likely to exist (either from the Drawings or inspection of the site), the Contractor is required to determine the exact locations of these existing installations. Damage to existing facilities, due to failure to properly accomplish the above, shall be repaired at the Contractors expense to the approval by the Architect and satisfaction of the District.

2. CALL AN UNDERGROUND SERVICE FIRM BEFORE TRENCHING, CALL U.S.A. (800) 624-2444.

3.5 SEALING PENETRATIONS

A. Flash and counter flash roof and wall penetrations with equipment manufactured for the purpose and as described in other Divisions of these Specifications or as Directed by the Architect. Apply mastic as required to seal absolutely watertight.

B. Conduits penetrating floor slabs or block or concrete walls shall be grouted and sealed watertight.

3.6 CUTTING AND PATCHING

A. Obtain the Architect's acceptance prior to cutting existing surfaces or surfaces under construction. All such surfaces must be repaired or patched to the satisfaction of the Architect.

3.7 EQUIPMENT ANCHORING

A. Seismic Withstand Requirements: Freestanding or wall-hung equipment shall be anchored in place by methods, which will meet the requirements of the Uniform Building code for seismic loads. The CONTRACTOR shall submit calculations in accordance with “Contractor Submittals”, for the design of the anchoring systems for all equipment, including panels, transformers, etc. in excess of 250 pounds. Calculations shall be performed, signed and stamped by a Structural Engineer or a Civil Engineer experienced in structural design and licensed in the State of California. The calculation shall provide an analysis of lateral and overturning forces and shall include a factor of safety against overturning equal to 1.5. The calculation shall also provide an analysis of both the anchoring system and the foundation or wall system to receive the anchor loads and shall show that the foundation is capable of resisting all anchor loads. Submittal shall include data on attachment hardware and methods that will satisfy withstand criteria.

B. Seismic bracing for light fixtures cable or pendant suspended from ceiling or roof structure shall be seismically braced to prevent fixture from swaying 45 degree in either direction of suspension point. Contractor shall use same cable used to suspend light fixture. Where pendants are used, the contractor shall use air craft light fixture suspension

cable. Submittal shall include data on attachment hardware and methods that will satisfy withstand criteria referred to in above paragraph.

3.8 PROTECTION CLEANING AND REPAIRS

A. All electrical equipment shall be protected from damage or degradation during construction. Electrical equipment stored or installed shall be protected from dust, water, or damage from other sources.

B. After all other work has been accomplished, such as plastering, painting, etc., and prior to final review by the Architect; all electrical equipment, especially equipment enclosures, panelboards, switchboards, and lighting fixtures shall be thoroughly cleaned (inside and out) of all dirt, water, grease, plaster, paint, or other construction debris. All surfaces shall be clean and in "new" condition. All scratches, dents, marks, cracks, etc., shall be repaired to the satisfaction of the Architect or the equipment shall be replaced at no additional cost.

3.9 ELECTRICAL EQUIPMENT DELIVERABLES

A. Retain and safeguard all detachable and spare devices, equipment, and literature (O&M manuals, instruction books, wiring diagrams, test reports, keys, fixtures, etc.) until completion of work. At this time, all items will be delivered to the District as directed by the Architect.

3.10 TESTS

A. Test under provisions of Section 26 08 13.

1. At completion of installation, test for operation, panel load balance, short circuits, and ground.

2. The building service and any separately derived system to have neutral bonding jumper opened and neutral and ground buses to be tested for infinite resistance. Test to be demonstrated to the County Representative. Where infinite resistance is not achieved, correct deficiencies and retest in the presence of County personnel.

3. Provide written test results for all tests.

B. Prior to energization of equipment, check the insulation resistance of listed circuits, with a 500 volt “Megger”.

C. Take precaution during the testing period to insure the safety of personnel and equipment.

D. Test all wiring for continuity and grounds before any fixtures or equipment are connected. Where such tests indicate faulty installation or other defects, the fault(s) shall be located and repaired at the Contractor's expense. The repaired installation shall then be retested.

E. Verify rotation of all three phase motors and reconnect if necessary.

F. Verify the resistance of the grounding electrode system(s).

G. Balance all loads on each panelboard and all other types of distribution equipment as applicable.

3.11 ADJUSTING

A. Adjust work under provisions of Section 26 08 13.

B. Inspect all equipment and put in good working order.

3.12 CLEANING

A. Clean work under provisions of Division 1.

B. Clean all items.

3.13 PROTECTION

A. Protect finished installation under provisions of Division 1.

B. Prior to installation, store items in clean, dry, indoor locations. Store in clean, dry, indoor, heated locations items subject to corrosion under damp conditions, and items containing electrical insulation, such as transformers, conductors, motors, and controls. Energize all space heaters furnished with equipment. Provide temporary heating, sufficient to prevent condensation, in transformers, switchgear, switchboards, motors, and motor control centers which do not have space heaters.

C. Following installation, protect materials and equipment from corrosion, physical damage, and the effects of moisture on insulation. When equipment intended for indoor installation is installed at the Contractor’s convenience in areas where it is subject to dampness, moisture, dirt, or other adverse atmosphere until completion of construction, ensure that adequate protection from these atmospheres is provided that is acceptable to the County Representative. Cap conduit runs during construction with manufactured seals. Keep openings in boxes or equipment closed during construction. Energize all space heaters furnished with equipment.

3.14 FINAL CONNECTION

A. Make final connection to the power distribution system at the building service point.

3.15 PUTTING SYSTEMS IN OPERATION - START UP

A. Operate all systems in good working order for a period of 5 consecutive days, at time period agreed to by the County Representative, prior to inspection.

END OF SECTION

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.

B. Wire and cable for 600 volts and less.

C. Wiring connectors.

D. Electrical tape.

E. Wire pulling lubricant.

F. Cable ties.

G. Firestop sleeves.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

C. Section 31 23 33 - Trenching and backfilling

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2020).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape 2017.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2009.

H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.

I. California Electrical Code (CEC) - 2022

J. UL 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.

K. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.

L. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.

M. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.

N. UL 486D - Sealed Wire Connector Systems Current Edition, Including All Revisions.

O. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

3. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Submittal Procedures, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Product Data: Provide for each cable assembly type.

D. Test Reports: Indicate procedures and values obtained.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

G. Project Record Documents: Record actual locations of components and circuits.

1.6 QUALITY ASSURANCE

A. Comply with requirements of CEC.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect/Engineer and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by CEC and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is not permitted.

F. Armored cable is not permitted.

G. Metal-clad cable is not permitted.

H. Concealed Dry Interior Locations: Use only building wire with Type THHN/THWN insulation in raceway.

I. Exposed Dry Interior Locations: Use only building wire in raceway or building wire with Type THHN/THWN insulation in raceway.

J. Above Accessible Ceilings: Use only building wire with Type THHN/THWN insulation in raceway.

K. Wet or Damp Interior Locations: Use only building wire with Type THWN insulation in raceway.

L. Exterior Locations: Use only building wire with Type THWN insulation in raceway.

M. Underground Installations: Use only building wire with Type THWN insulation in raceway.

N. Use solid conductor for feeders and branch circuits 10 AWG and smaller.

O. Use stranded conductors for control circuits.

P. Use conductor not smaller than 10 AWG for receptacles and lighting circuit homeruns.

Q. Use conductor not smaller than 12 AWG for power and lighting circuits.

R. Use conductor not smaller than 14 AWG for control circuits.

S. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.

T. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 150 feet.

U. Conductor sizes are based on copper unless indicated as aluminum or "AL".

2.2 WIRE MANUFACTURERS (LISTED IN ALPHABETICALLY ORDER ONLY AND NOT NECESSARY BY PREFERENCE)

A. Cerro Wire LLC: www.cerrowire.com.

B. Industrial Wire & Cable, Inc: www.iewc.com.

C. Southwire Company: www.southwire.com.

D. Or Equal.

2.3 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of CEC.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.

H. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.

I. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.

J. Conductor Material:

1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

3. Tinned Copper Conductors: Comply with ASTM B33.

K. Minimum Conductor Size:

1. Device and lighting homeruns: 10 AWG.

2. Branch Circuits: 12 AWG.

a. Exceptions:

1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.

2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.

3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.

3. Control Circuits: 14 AWG.

L. Where conductor size is not indicated, size to comply with CEC but not less than applicable minimum size requirements specified.

M. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.

2. Color Coding Method: Integrally colored insulation.

a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.

3. Color Code:

a. 480Y/277 V, 3 Phase, 4 Wire System:

1) Phase A: Brown.

2) Phase B: Orange.

3) Phase C: Yellow.

4) Neutral/Grounded: Gray.

b. 208Y/120 V, 3 Phase, 4 Wire System:

1) Phase A: Black.

2) Phase B: Red.

3) Phase C: Blue.

4) Neutral/Grounded: White.

c. Equipment Ground, All Systems: Green.

d. Isolated Ground, All Systems: Green with yellow stripe.

e. For control circuits, comply with manufacturer's recommended color code.

2.4 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:

1. Feeders and Branch Circuits:

a. Size 10 AWG and Smaller: Solid.

b. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:

1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2.

E. Conductor: Copper.

F. Insulation Voltage Rating: 600 volts.

G. Insulation: CEC, Type THHN/THWN.

2.5 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.

C. Wiring Connectors for Splices and Taps:

1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.

2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.

2. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

H. Mechanical Connectors: Provide bolted type or set-screw type.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.

2.6 ACCESSORIES

A. Electrical Tape:

1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.

2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

B. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

C. Cable Ties: Material and tensile strength rating suitable for application.

D. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with CEC.

D. Verify that raceway installation is complete and supported.

E. Verify that field measurements are as indicated.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.

2. When circuit destination is indicated without specific routing, determine exact routing required.

3. Arrange circuiting to minimize splices.

4. Include circuit lengths required to install connected devices within 10 ft of location indicated.

5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with CEC.

6. Maintain separation of wiring for emergency systems in accordance with CEC.

7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:

a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.

b. Increase size of conductors as required to account for ampacity derating.

c. Size raceways, boxes, etc. to accommodate conductors.

8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted, unless noted otherwise shown on plans. Provide dedicated neutral/grounded conductor for each individual branch circuit..

B. Run panelboard and motor feeders in individual conduits.

C. Install products in accordance with manufacturer's instructions.

D. Perform work in accordance with NECA 1 (general workmanship).

E. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.

2. Pull all conductors and cables together into raceway at same time.

3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.

4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.

H. Install conductors with a minimum of 12 inches of slack at each outlet.

I. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with CEC.

L. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

N. Insulate ends of spare conductors using vinyl insulating electrical tape.

O. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

P. Identify conductors and cables in accordance with Section 26 05 53.

Q. Color Code Legend: Provide identification label identifying color code for ungrounded conductors at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

S. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

T. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.

U. Route wire and cable as required to meet project conditions.

1. Wire and cable routing indicated is approximate unless dimensioned.
2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

3. Include wire and cable of lengths required to install connected devices within 10 ft of location shown.

V. Use wiring methods indicated.

W. Pull all conductors into raceway at same time.

X. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

Y. Protect exposed cable from damage.

Z. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.

AA. Use suitable cable fittings and connectors.

BB. Neatly train and lace wiring inside boxes, equipment, and panelboards.

CC. Clean conductor surfaces before installing lugs and connectors.

DD. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

EE. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

FF. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

GG. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

HH. Identify and color code wire and cable under provisions of Section 26 0553.

II. Identify each conductor with its circuit number or other designation indicated.

JJ. Mark properly torqued connections with a line, black ink.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Perform field inspection and testing in accordance with Section 01 4000.

C. Inspect and test in accordance with NETA ATS, except Section 4.

D. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

E. Correct deficiencies and replace damaged or defective conductors and cables.

F. Perform inspections and tests listed in NETA STD ATS, Section 7.3.2.

G. Inspect wire for physical damage and proper connection.

H. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

I. Verify continuity of each branch circuit conductor.

J. Megger test and record all feeder conductors.

1. Replace conductors failing test.

2. Test replaced conductors in same manner.

END OF SECTION

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Grounding and bonding components.

F. Provide all components necessary to complete the grounding system(s) consisting of:

1. Metal underground water pipe.
2. Metal frame of the building.
3. Steel water storage tank and supports.
4. Concrete-encased electrode.
5. Metal underground gas piping system.

1.2 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

C. Section 03 2000 - Concrete Reinforcing.

D. Section 03 3000 - Cast-in-Place Concrete.

E. Section 26 56 00 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

F. Section 26 08 13 - Acceptance Testing.

1.3 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. California Electrical Code (CEC) - 2022

D. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify exact locations of underground metal water service pipe entrances to building.

2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.

3. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 5 ohms.

1.6 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide for grounding electrodes and connections.

C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Field quality control test reports.

F. Project Record Documents: Record actual locations of components and grounding electrodes.

G. Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

1.7 QUALITY ASSURANCE

A. Comply with requirements of CEC.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by CEC and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Grounding Electrode conductor: as indicated on plans or size to comply with CEC article 250, whichever is larger.

D. Grounding System Resistance:

1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect/Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.

2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

E. Grounding Electrode System:

1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.

a. Provide continuous grounding electrode conductors without splice or joint.

b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.

2. Metal Underground Water Pipe(s):

a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.

b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.

c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.

3. Metal In-Ground Support Structure:

    a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with CEC.

4. Concrete-Encased Electrode:

    a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with CEC.

5. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

6. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in CEC. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.

    a. Ground Bar Size: 1/4 by 4 by 12 inches unless otherwise indicated or required.

    b. Install the copper ground bar in a NEMA 1 screw cover cabinet, minimum size 18 inches x 12 inches x 6 inches.

    c. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.

    d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

7. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in CEC.

F. Service-Supplied System Grounding:

1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.

2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:

1. Provide grounding electrode system for each separate building or structure.

2. Provide equipment grounding conductor routed with supply conductors.

3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.

4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.

H. Separately Derived System Grounding:

1. Separately derived systems include, but are not limited to:

a. Transformers (except autotransformers such as buck-boost transformers).

b. Uninterruptible power supplies (UPS), when configured as separately derived systems.

c. Generators, when neutral is switched in the transfer switch.

2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.

3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.

4. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with CEC.

5. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.

6. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

I. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with CEC.

2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.

3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with CEC.

4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.

6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

7. Provide bonding for interior metal piping systems in accordance with CEC. This includes, but is not limited to:

   a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.

   b. Metal gas piping.

8. Provide bonding for metal building frame.

9. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.

J. Isolated Ground System:

1. Where isolated ground receptacles or other isolated ground connections are indicated, provide separate isolated/insulated equipment grounding conductors.

2. Connect isolated/insulated equipment grounding conductors only to separate isolated/insulated equipment ground busses.

3. Connect the isolated/insulated equipment grounding conductors to the solidly bonded equipment ground bus only at the service disconnect or separately derived system disconnect. Do not make any other connections between isolated ground system and normal equipment ground system on the load side of this connection.

K. Communications Systems Grounding and Bonding:

1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with CEC.

2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.

   a. Bonding Jumper Size: As indicated.

b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.

c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.

d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

L. Pole-Mounted Luminaires: Also comply with Section 26 56 00.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.

2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:

1. Use insulated copper conductors unless otherwise indicated.

a. Exceptions:

1) Use bare copper conductors where installed underground in direct contact with earth.

2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.

a. Exceptions:

1) Use mechanical connectors for connections to electrodes at ground access wells.

3. Unless otherwise indicated, use mechanical connectors for accessible connections.

a. Exceptions:

1) Use exothermic welded connections for connections to metal building frame.

4. Manufacturers - Mechanical and Compression Connectors:

a. Burndy LLC; _____: www.burndy.com/#sle.

b. Thomas & Betts Corporation: www.tnb.com/#sle.

5. Manufacturers - Exothermic Welded Connections:

a. Burndy LLC; _____: www.burndy.com/#sle.

b. Cadweld, a brand of Erico International Corporation: www.erico.com/#sle.

D. Ground Bars:

1. Description: Copper rectangular ground bars with mounting brackets and insulators.

2. Size: As indicated.

3. Holes for Connections: As indicated or as required for connections to be made.

2.3 CONNECTORS AND ACCESSORIES

A. Mechanical Connectors: Bronze.

B. Wire: Stranded copper.

C. Grounding Electrode Conductor: as indicted on plans or size to meet CEC Article 250, whichever is larger.

D. Grounding Well:

1. Well Pipe: 8 inch by 24 inch long clay tile pipe with belled end.

2. Well Cover: Cast iron with legend "GROUND" embossed on cover.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify existing conditions prior to beginning work.

E. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.

2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.

4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

D. Identify grounding and bonding system components in accordance with Section 26 05 53.

E. Install ground electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

F. Provide grounding well pipe with cover at each rod location. Install well pipe top flush with finished grade.

G. Install 3/0 AWG bare copper wire in foundation footing .

H. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing . Bond steel together.

I. Provide bonding to meet requirements described in Quality Assurance.

J. Provide isolated grounding conductor for circuits supplying electronic cash registers.

K. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

L. Ground Electrodes: Provide a grounding electrode system in the main electrical room/space of each building as follows:

1. Provide a 4-inch x 1/4-inch copper ground bar. Length shall be a minimum of 12 inches but longer as required for the number of connections made to the bar. This bar shall serve as the connection point for all grounding electrodes in the building. Install the copper ground bar in a NEMA 1 screw cover cabinet, minimum size 18 inches x 12 inches x 6 inches.

2. Connect the copper ground bar to the underground metal pipe (other than gas).

a. Connect to metal pipe with approved pipe clamp near the pressure reducing valve.

b. Connect to ground bar with exothermic weld.

c. Connect to metal pipe with copper clamp where copper water pipe occurs and with a malleable iron clamp where cast iron pipe occurs.

d. Install grounding conductor, sized as indicated on plans, in a 3/4-inch metal conduit from the ground cabinet to the water pipe. Provide grounding bushings at each end of the conduit.

3. Connect the copper ground bar to the metal frame of the building.

a. At all steel framed buildings, provide a connection to the closest column.

b. Connect to column with exothermic weld.

c. Connect to the ground bar with exothermic weld or bolted-type connector.

d. Install grounding conductor, sized as indicated on the plans, in a 3/4-inch metal conduit from the ground cabinet to the column. Provide grounding bushing at each end of the conduit.

4. Connect the copper ground bar to a concrete-encased electrode/Ufer.

a. Install a minimum of 20 feet of #3/0 AWG conductor (minimum unless noted otherwise) encased in a minimum of 3 inches of concrete. Provide a non-metallic protective sleeve, minimum 6 inches long (3 inches in the concrete and 3 inches out of the concrete), located where the conductor exits the concrete.

b. Install a #3/0 conductor from the ground bar to the concrete-encased electrode in a 3/4-inch metal conduit with grounding bushings. Make connections to the concrete-encased electrode with a bolted-type connector and transition from the metal conduit and non-metallic sleeve.

c. Connect to the ground bar with exothermic weld or bolted-type connector.

5. Provide additional ground rod or concrete-encased electrodes as required to meet the performance requirements listed in paragraph 1.03 at the ground bar.

a. Install additional ground rods a minimum of 5 feet from any other rod.

b. Notify the County Representative if performance requirements have not been met after installing 2 additional ground rods or concrete-encased electrodes.

6. Install other grounding electrodes as indicated on the single line diagram and other Contract Documents.

M. Grounding Electrode Conductor

1. Install grounding electrode conductor from the main normal and emergency power panels and each separately derived system in the building to the ground bar (grounding electrode system). Install grounding electrode conductor in steel conduit and bond grounding conductor to conduit at entrance and exit. Connect to the ground bar (grounding electrode system) with exothermic weld.

    a. Unless otherwise indicated, install main ground unspliced.

    b. Make connections easily accessible for inspection in ground bar cabinet.

2. Grounding electrode conductor shall be of the same type and quality as other conductors in the building.

3. The main neutral to ground bonding jumper will be located at the site utilities switchboard. Locate additional neutral to ground bonding jumper at separately derived systems only, or at the main service panel when the building is served from a dedicated transformer. Neutral bar with all interior secondary neutrals shall be isolated from the common equipment grounding bus at all other locations.

N. Bonding

1. Provide bonding to meet requirements of CEC.

2. Bond together metal siding not attached to grounded structure; bond to ground.

3. Bond pre-fabricated metal building to grounding electrode system at a minimum of one location.

4. Bond together all metallic conduit, boxes, cabinets and enclosures.

O. Grounding Conductors

1. Provide isolated grounding conductor for circuits indicated.

2. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder circuit raceway and within each motor feeder raceway. Terminate each end on suitable lug, bus, or bushing.

3. Provide separate, isolated grounding conductor for each circuit which is installed (all or in part) in non-metallic conduit.

4. Provide separate grounding conductor for circuits installed in flexible steel conduit. Terminate each end on a suitable lug, bus or bushing.

5. Ground all conduit systems, cabinets, equipment, motor frames, etc., in accordance with CEC and applicable codes.

P. Grounding Connections

1. Ground shields of shielded power cable and signal cable at each splice or termination in accordance with recommendations of the splice or termination manufacturer.

2. Ground metal sheathing and exposed metal vertical structural elements of buildings. Ground metal fences enclosing electrical equipment. Bond any metal equipment platforms which support electrical equipment to that equipment. Provide good electrical contact between metal frames and railings supporting pushbutton stations, receptacles, instrument cabinets, etc., and raceways carrying circuits to these devices.

3. Ground all fencing as shown on the grounding details on the Drawings.

4. Bond neutrals of transformers within buildings to the system ground network, and to additional indicated grounding electrodes.

5. Unless shown otherwise, make connections of grounding conductors to ground rods at the upper end of the rod with the end of the rod and the connection point below finished grade.

6. Make connections of sections of outdoor ground mats (counterpoise) for substations or other equipment underground. Make connections of other grounding conductors generally accessible.

7. In manhole pull boxes, install ground rods with ends 4 to 6 inches above the floor with connections of grounding conductors fully visible and accessible.

8. When making thermite welds, wire brush or file the point of contact to a bare metal surface. Use thermite welding cartridges and molds in accordance with the manufacturer’s recommendations. After welds have been made and cooled, brush slag from the weld area and thoroughly clean the joint. Re-galvanize area if required. For compression connectors, use homogeneous copper, anti?corrosion, surface treatment compound at connectors in accordance with connector manufacturer’s recommendations. Use connectors of proper size for conductors and ground rods specified. Use connector manufacturer’s compression tool. Notify the County Representative prior to backfilling any ground connections.

9. Grounding pad plates shall be cast into the slab with the surface flush with the finished floor.

3.3 FIELD QUALITY CONTROL

A. Site Tests

1. Test under provisions of Section 26 08 13.

2. Notify the County Representative five days before inspection and testing.

3. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method.

4. Remove main bonding jumper at main service switchboard and at each separately derived system and test for infinite resistance between neutral and ground systems. Reconnect bonding jumper(s).

5. Record test results in accordance with 26 08 13 and submit.

B. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

C. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

D. Inspection

1. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

E. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 05 50 00 - Metal Fabrications: Materials and requirements for fabricated metal supports.

C. Section 11 98 16 - Detention Fasteners.

D. Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

E. Section 26 05 33.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

F. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

G. Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

H. Section 26 56 00 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.3 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

B. MFMA-4 - Metal Framing Standards Publication 2004.

C. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2009.

D. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2006

E. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2010

F. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2009.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

H. California Electrical Code (CEC) - 2022

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.

2. Coordinate work to provide additional framing and materials required for installation.

3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.

4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.

5. Notify Architect/Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03 30 00.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Design Data

1. Indicate hanger and support framing and attachment methods.

2. Submit seismic zone 4 and structural calculations in accordance with Section 26 05 48.

C. Product Data: Provide manufacturer’s catalog data for fastening systems.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

A. Conform to requirements of CEC.

B. Installer Qualifications for Field Welding: See Section 05 50 00.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Comply with the following. Where requirements differ, comply with most stringent.

a. NFPA 70.

b. Requirements of authorities having jurisdiction.

2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.

3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.

4. Do not use products for applications other than as permitted by CEC and product listing.

5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.

a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.

b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.

d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Components for Vibration Isolation and/or Seismic Controls: See Section 26 05 48.

C. Materials for Metal Fabricated Supports: See Section 05 50 00.

D. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.

2. Conduit Clamps: Bolted type unless otherwise indicated.

E. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

F. Metal Channel/Strut Framing Systems:

1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
2. Comply with MFMA-4.
3. Channel Material:
    a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
4. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
5. Minimum Channel Dimensions: 1-5/8 inch width by 1-5/8 inch height.

G. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
    a. Equipment Supports: 1/2-inch diameter.
    b. Busway Supports: 1/2-inch diameter.
    c. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch diameter.
    d. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch diameter.
    e. Trapeze Support for Multiple Conduits: 3/8-inch diameter.
    f. Outlet Boxes: 1/4-inch diameter.
    g. Luminaires: 1/4-inch diameter.

H. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
1. Description: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring attachment to roof structure and not penetrating roofing assembly, with support fixtures as specified.
2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

I. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Plastic and lead anchors are not permitted.
10. Powder-actuated fasteners are not permitted.
11. Hammer-driven anchors and fasteners are not permitted.
12. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
    b. Comply with MFMA-4.
    c. Channel Material: Use galvanized steel.
    d. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum base metal thickness.

2.2 MANUFACTURERS (LISTED IN ALPHABETICALLY ORDER ONLY AND NOT NECESSARY BY PREFERENCE)

A. Thomas & Betts Corporation: www.tnb.com.

B. Threaded Rod Company: www.threadedrod.com.

C. Or Equal..

2.3 SUPPORTS

A. Pipe hangers for individual conduits shall be factory made, consisting of a pipe ring and threaded suspension rod. The pipe ring shall be malleable iron, split and hinged, or shall be springable wrought steel. Rings shall be bolted to or interlocked with the suspension rod socket.

B. Pipe racks for groups of parallel conduits shall be constructed of galvanized structural steel preformed channels of length as required, suspended on threaded rods and secured thereto with nuts above and below the cross bar.

C. Factory made pipe straps shall be one hole malleable iron or two hole galvanized clamps.

D. Supporting rods shall be at least 3/8" diameter and channel shall be at least 3/4" deep. Supporting hardware shall be galvanized steel.

2.4 MATERIALS

A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.

B. Supports: Fabricated of structural steel or formed steel members; galvanized.

C. Anchors and Fasteners:

D. Concrete Structural Elements: Use precast inserts, expansion anchors, or preset inserts.

E. Steel Structural Elements: Use beam clamps or welded fasteners.

F. Concrete Surfaces: Use self-drilling anchors or expansion anchors.

G. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.

H. Solid Masonry Walls: Use expansion anchors or preset inserts.

I. Sheet Metal: Use sheet metal screws.

J. Wood Elements: Use wood screws.

K. Fastener Types:

1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.

2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.

3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.

4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.

5. Other Types: As required.

6. Manufacturers:

a. Powers Fasteners, Inc: www.powers.com.

b. Or Equal..

L. Formed Steel Channel:

M. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect/Engineer, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect/Engineer, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:

1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.

2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Conduit Support and Attachment: See Section 26 05 33.13 for additional requirements.

I. Box Support and Attachment: See Section 26 05 33.16 for additional requirements.

J. Interior Luminaire Support and Attachment: See Section 26 51 00 for additional requirements.

K. Exterior Luminaire Support and Attachment: See Section 26 56 00 for additional requirements.

L. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

M. Secure fasteners in accordance with manufacturer's recommended torque settings.

N. Remove temporary supports.

O. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with CEC.

P. Anchors

1. Concrete - Precast inserts, cast-in-place anchors or expansion type anchor bolts.

   a. When installing drilled-in anchors in non-prestressed reinforced concrete, avoid the reinforcing bars.

   b. When installing drilled-in anchors into prestressed concrete (pre- or post-tensioned), locate tendons by using a non-destructive method prior to installation. Maintain a minimum clearance of one-inch between the reinforcement and the drilled-in anchor.

2. Sheet Metal - Sheet metal screws or machine bolts, nuts and washers.

3. Structural Steel Members - Beam clamps, machine screws, bolts, nuts and washers.

Q. Supports

1. Fabricate supports from structural steel or steel channel. Rigidly weld or bolt members to present a neat appearance with adequate strength and rigidity.

2. Vertical adjustment on threaded rods shall be with 2 nuts on each end for positioning and locking.

R. Conduit

1. In damp or wet locations, space conduit support directly from concrete or metal structure out at least 1/4 inch using straps with spacers or, if three (3) or more conduits are located in a parallel run, they shall be spaced out from the wall approximately 5/8 inch to 1 inch by means of channel.

2. Runs of individual conduit suspended from the floor or ceiling shall be supported with pipe hangers. Where three (3) or more conduits are suspended from the floor/ceiling, suitable racks shall be constructed from channel material with suitable fittings.

3. Space supporting points no greater than required by CEC.

S. Raceway Other Than Conduit

1. Support from structure in accordance with manufacturers’ instructions.

T. Equipment

1. Install surface-mounted cabinets and panelboards with a minimum of four anchors.
2. In wet and damp locations use steel channel supports to stand cabinets and panelboards 13/16 inch minimum off wall.
3. Use sheet metal channels to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
4. Support equipment in accordance with manufacturer's instructions.
5. Verify that equipment will fit support layouts indicated.
    a. Where substitute equipment is used, revise indicated supports to fit at no additional cost.
6. Arrange for necessary openings to allow entry of equipment.
    a. Where equipment cannot be installed as structure is being erected, provide and arrange for building-in of boxes, sleeves or other devices to allow later installation.

U. Sleeves

1. Set sleeves in position in formwork. Provide reinforcing around sleeves.
2. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves full depth and provide floor plate.
3. Where raceway penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk seal.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

1. Obtain permission from the Architect and the Structural Engineer before drilling or cutting structural members.

END OF SECTION

SECTION 26 05 33.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Intermediate metal conduit (IMC).

C. PVC-coated galvanized steel rigid metal conduit (RMC).

D. Flexible metal conduit (FMC).

E. Liquidtight flexible metal conduit (LFMC).

F. Electrical metallic tubing (EMT).

G. Rigid polyvinyl chloride (PVC) conduit.

H. Conduit fittings.

I. Accessories.

J. Conduit, fittings and conduit bodies.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 07 84 00 - Firestopping.

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

1. Includes additional requirements for fittings for grounding and bonding.

D. Section 26 05 29 - Hangers and Supports for Electrical Systems.

E. Section 26 05 33.16 - Boxes for Electrical Systems.

F. Section 26 0553 - Identification for Electrical Systems.

G. Section 31 23 23 - Fill: Bedding and backfilling.

H. The requirements of the kitchen equipment consultan plans and specifications.

1.3 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2015.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2015.

C. ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A) 2015.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2013.

F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) 2017.

G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.

H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit 2018.

I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit 2020.

J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing 2016.

K. California Electrical Code (CEC) - 2022

L. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.

M. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings Current Edition, Including All Revisions.

N. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.

3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.

4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.

5. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

C. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, nonmetallic conduit, fittings, and conduit bodies.

D. Project Record Documents: Accurately record actual routing of conduits larger than 1 1/4 inches.

1.6 AS-BUILT DOCUMENTS

A. Submit under provisions of Division 1.

B. Accurately record actual routing of conduits larger than 2 inches in diameter.

1.7 QUALITY ASSURANCE

A. Conform to requirements of CEC.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.

2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.

3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.

4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit or PVC-coated galvanized steel rigid metal conduit where emerging from underground.

5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows or PVC-coated galvanized steel rigid metal conduit elbows for bends.

6. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.

7. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.

D. Embedded Within Concrete:

1. Within Slab on Grade: Not permitted.

2. Within Slab Above Ground: Not permitted.

3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.

4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit or PVC-coated galvanized steel rigid metal conduit where emerging from concrete.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

1. Locations subject to physical damage include, but are not limited to:

a. Where exposed below 8 feet, except within electrical and communication rooms or closets.

b. Where exposed below 20 feet in warehouse areas.

K. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit.

L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

M. Corrosive Locations Above Ground: Use PVC-coated galvanized steel rigid metal conduit.

N. Hazardous (Classified) Locations: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), aluminum rigid metal conduit, or PVC-coated galvanized steel rigid metal conduit.

O. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.

1. Maximum Length: 6 feet.

P. Connections to Vibrating Equipment:

1. Dry Locations: Use flexible metal conduit.
2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
3. Maximum Length: 6 feet unless otherwise indicated.
4. Vibrating equipment includes, but is not limited to:
    a. Transformers.
    b. Motors.

2.2 CONDUIT REQUIREMENTS

A. Fittings for Grounding and Bonding: Also comply with Section 26 05 26.

B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Minimum Conduit Size, Unless Otherwise Indicated:
1. Branch Circuits: 3/4 inch (21 mm) trade size.
2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
3. Control Circuits: 3/4 inch (21 mm) trade size.
4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.
5. Underground, Interior: 1 inch (27 mm) trade size.
6. Underground, Exterior: 1 inch (27 mm) trade size.

E. Where conduit size is not indicated, size to comply with CEC but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
2. Nucor Tubular Products: www.nucortubular.com/#sle.
3. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
4. Or equal.

B. Description: CEC, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:

1. Manufacturers:

a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.

b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.

c. Thomas & Betts Corporation: www.tnb.com/#sle.

d. Or equal.

e. Substitutions: See Section 01 60 00 - Product Requirements.

2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.

4. Material: Use steel or malleable iron.

a. Do not use die cast zinc fittings.

5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.4 INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:

1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.

2. Nucor Tubular Products: www.nucortubular.com/#sle.

3. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.

4. Or equal.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: CEC, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:

1. Manufacturers:

a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.

b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.

c. Thomas & Betts Corporation: www.tnb.com/#sle.

d. Or equal.

e. Substitutions: See Section 01 60 00 - Product Requirements.

2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.

4. Material: Use steel or malleable iron.

a. Do not use die cast zinc fittings.

5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.5 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:

1. Allied Tube & Conduit: www.alliedtube.com.

2. Thomas & Betts Corporation: www.tnb.com/#sle.

3. Robroy Industries: www.robroy.com/#sle.

4. Or Equal..

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: CEC, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

C. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil.

D. PVC-Coated Fittings:

1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.

2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.

3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.

4. Material: Use steel or malleable iron.

5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil.

E. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil.

F. Description: NEMA RN 1; rigid steel conduit with external PVC coating.

G. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.6 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:

1. AFC Cable Systems, Inc: www.afcweb.com/#sle.

2. Electri-Flex Company: www.electriflex.com/#sle.

3. International Metal Hose: www.metalhose.com/#sle.

4. Or Equal.____.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: CEC, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

C. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.

a. Do not use die cast zinc fittings.

D. Description: Interlocked steel construction.

E. Fittings: NEMA FB 1.

2.7 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:

1. AFC Cable Systems, Inc: www.afcweb.com/#sle.

2. Electri-Flex Company: www.electriflex.com/#sle.
3. International Metal Hose: www.metalhose.com/#sle.
4. Or Equal.____.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: CEC, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
   a. Do not use die cast zinc fittings.

D. Description: Interlocked steel construction with PVC jacket.

E. Fittings: NEMA FB 1.

2.8 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied Tube & Conduit: www.alliedeg.com/#sle.
2. Beck Manufacturing, Inc: www.beckmfg.com.
3. Wheatland Tube Company: www.wheatland.com/#sle.
4. Or Equal.____.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: CEC, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
   a. Do not use die cast zinc fittings.
3. Connectors and Couplings: Use compression (gland) or set-screw type.

a. Do not use indenter type connectors and couplings.

4. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.

5. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

D. Description: ANSI C80.3; galvanized tubing.

E. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type.

2.9 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:

1. Cantex Inc: www.cantexinc.com/#sle.

2. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com/#sle.

3. JM Eagle: www.jmeagle.com/#sle.

4. Or equal.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: CEC, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:

1. Manufacturer: Same as manufacturer of conduit to be connected.

2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.10 NONMETALLIC TUBING SHALL NOT BE USED FOR THIS PROJECT, NO EXCEPTIONS.

2.11 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.

E. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

2.12 WARNING TAPE

A. Tape: Heavy-gauge, yellow plastic; minimum 6inch width for use in trenches containing electric circuits; material resistant to corrosive soil and containing a metallic tracer wire for use with cable locators; printed warning that electric circuit is located below the tape.

1. Manufacturers and Types:

a. 3M.

b. Calpico.

c. Plymouth, Vinyl Tape.

d. Griffolyn Co, Terra Tape.

e. ITT Blackburn, Type YT or RT.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify routing and termination locations of conduit prior to rough-in.

E. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install intermediate metal conduit (IMC) in accordance with NECA 101.

E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.

F. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

G. Telephone system conduits shall be installed in accordance with Section 27 30 00

H. Ground and bond conduit under provision of Section 26 05 26.

I. Identify conduit under provisions of Section 26 05 53.

J. Where conduit systems penetrate or parallel fire and/or smoke rated walls, ceilings, roofs or floors, maintain the fire rating integrity. Comply with Section 07 84 00.

K. Install nonmetallic conduit in accordance with manufacturer's instructions.

L. Provide heavy nylon cord pull string in each empty conduit except sleeves and nipples. Pull line to have a minimum of 200 pound pull strength. Tag each end of string with destination. Leave a minimum of 24 inches of slack and tie-off at each end.

M. Within finished areas of building. Install all conduits concealed.

N. Exposed overhead conduit may be used in areas with exposed metal structure, Switchgear Rooms, Mechanical Equipment Rooms, Electric Closets, and Equipment Rooms only.

O. Locate boxes in accordance with Section 26 05 34 before installing conduit.

P. Do not use setscrew type couplings, bushings, elbows, nipples, or other fittings for Intermediate Metal Conduit unless specifically approved by the County Representative.

Q. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.

2. When conduit destination is indicated without specific routing, determine exact routing required.

3. Conceal all conduits unless specifically indicated to be exposed.

4. Conduits in the following areas may be exposed, unless otherwise indicated:

    a. Electrical rooms.

    b. Mechanical equipment rooms.

    c. Within joists in areas with no ceiling.

5. Unless otherwise approved, do not route conduits exposed:

    a. Across floors.

b. Across roofs.

c. Across top of parapet walls.

d. Across building exterior surfaces.

6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.

7. Arrange conduit to maintain adequate headroom, clearances, and access.

8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.

9. Arrange conduit to provide no more than 150 feet between pull points.

10. Route conduits above water and drain piping where possible.

11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.

12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.

13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:

    a. Heaters.

    b. Hot water piping.

    c. Flues.

14. Group parallel conduits in the same area together on a common rack.

15. Route conduit in and under slab from point to point.

16. Route other conduit parallel and perpendicular to walls.

17. Unless otherwise indicated or specifically approved by the County Representative, route conduit below metal decks without concrete toppings.

18. In outdoor, underground, or wet locations, use watertight couplings and connections in raceways.

19. Thoroughly clean threads of oil, tailings and paint threads of galvanized conduits that are installed in exposed or damp locations with zinc-rich paint or liquid galvanizing compound before assembling.

20. Do not notch or penetrate structural members for passage of raceways except with prior approval of the County Representative.

21. Do not run raceways in equipment foundation pads.

22. Install concealed, embedded, and buried raceways so that they emerge at right angles to the surface and have none of the curved portion of the bend exposed.

R. Fitting:

1. Cut conduit square using saw or pipe cutter; deburr cut ends.

2. Bring conduit to shoulder of fittings; fasten securely.

3. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

4. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

5. Install no more than equivalent of four 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one shot bender to fabricate bends in metal conduit larger than 2 inch size.

6. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

7. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic zone 4, control and expansion joints.

8. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

9. Make joints in threaded conduit watertight with white nonleaded compound applied to male threads only.

    a. Cut square, ream smooth, and properly thread filed joints to receive couplings.

    b. Do not use running threads. Fit all conduit ends at switch and outlet boxes with approved lock nuts and bushing forming approved tight bond with box when screwed tightly in place.

10. Remove moisture and debris from conduit before wire is drawn into place. Tightly plug ends of conduit with plastic inserts until wire is pulled.

11. Neatly seal openings around conduits, etc., where they pass through fire rated construction or exterior walls or roof in accordance with Section 07 84 00.

12. Install conduit to roof exhaust fans through fan housing with no conduit exposed.

13. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation specified under Division 7.

14. Provide escutcheon plates at exposed wall, ceiling and floor conduit penetrations.

S. Bends:

1. Make changes in direction of runs with symmetrical bends or cast metal fittings. Make bends and offsets of the longest practical radius. Avoid field made bends and offsets where possible, but where necessary, make with an acceptable hickey or conduit bending machine. Do not heat metal raceways to facilitate bending.

2. Make bends in parallel or banked runs of raceways from the same center or centerline so that bends are parallel and of neat appearance. Factory elbows may be used in parallel or banked raceways if there is a change in the plane of the run and the raceways are of the same size. Otherwise, make field bends in parallel runs.

3. For PVC conduits, use factory made elbows for all bends 30 degrees or larger. Use acceptable heating methods for forming smaller bends.

4. For duct bank runs for site electrical distribution including signal/communications ducts, use only utility type large radius sweeps, (12 times trade size).

5. Make no bends in flexible conduit that exceed allowable bending radius of the cable to be installed or that significantly restricts the conduit's flexibility.

T. Bushing and Insulating Sleeves:

1. Where metallic conduit enters metal equipment enclosures through conduit openings, install a bonding bushing on the end of each conduit. Install a bonding jumper from the bushing to any equipment ground bus or ground pad.

2. If neither exists, connect the jumper to a lag-bolt connection to the metallic enclosure.

3. Use manufacturer's standard insulating sleeves in all metallic conduits terminating at an enclosure.

U. Conduit Support:

1. Secure and support conduits in accordance with CEC and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.

4. Use conduit strap to support single surface-mounted conduit.
    a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
8. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
9. Use of spring steel conduit clips for support of conduits is not permitted.
10. Arrange supports to prevent misalignment during wiring installation.
11. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
12. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
13. Fasten conduit supports to building structure and surfaces under provisions of Section 26 05 29.
14. Do not attach conduit to ceiling support wires.
15. Conduit Installation:
    a. Support all conduit systems from building structure or walls with approved hangers.
        1) Do not support from piping, ducts or support system for piping or ducts.
        2) Do not install to prevent ready removal of piping, ducts or ceiling tiles.
        3) Do not support from ceiling or ceiling support systems.
16. Use of wire for support of conduits is not permitted.

V. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.

3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

W. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
9. Provide metal escutcheon plates for conduit penetrations exposed to public view.
10. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

11. Seal the interior of all raceways entering structures including manholes, handholes, and pullboxes at the first box or outlet with oakum or suitable plastic expandable compound to prevent the entrance into the structure of gases, liquids, or rodents.

12. Dry pack with nonshrink grout around raceways that penetrate concrete walls, manholes, handholes, pullboxes, or floors, or use one of the methods specified for underground penetrations. The seal shall prevent water seepage around the raceways.

13. Where an underground raceway enters a structure through a non-waterproofed wall, install a sleeve made of Schedule 40 galvanized pipe. Fill the space between the conduit and sleeve with a suitable plastic expandable compound, or an oakum and lead joint, on each side of the wall in such a manner as to prevent entrance of moisture. A watertight entrance sealing device may be used in lieu of the sleeve.

14. Where raceways penetrate fire rated walls, floors, or ceilings, fire stop openings around electrical penetrations to maintain the fire resistance rating.

X. Underground Installation:

1. Coordinate installation of underground raceways with other outside and building construction work.

2. Remove entirely and properly reinstall all raceway installations not in compliance with these requirements.

3. Do not use union type fittings underground.

4. Provide a minimum cover of 30 inches over all low voltage and communication underground raceways unless otherwise indicated. Provide a minimum cover of 36 inches over all high voltage underground raceways unless otherwise indicated.

5. Do not backfill underground direct burial raceways until they have been inspected by the County Representative.

6. Warning Tapes: Bury warning tapes approximately 12 inches above all underground conduit runs or duct banks. Align parallel to and within 12 inches of the centerline of runs.

7. Trenching requirements shall be in conformance with Specification Section 31 23 33.

Y. Provide trenching and backfilling in accordance with Section 31 23 33.

Z. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 30 00 with minimum concrete cover of 3 inches on all sides unless otherwise indicated.

AA. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with CEC.

BB. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:

1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with CEC for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

CC. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:

1. Where conduits pass from outdoors into conditioned interior spaces.
2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

DD. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

EE. Provide grounding and bonding in accordance with Section 26 05 26.

FF. Separation and Support:

1. Separate parallel runs of two or more raceways in a single trench with preformed, nonmetallic spacers designed for the purpose. Install spacers at intervals not greater than that specified in the CEC for support of the type raceways used, and in no case greater than 10 feet.
2. Support raceways installed in fill areas to prevent accidental bending until backfilling is complete. Tie raceways to supports, and raceways and supports to the ground, so that raceways will not be displaced when concrete encasement or earth backfill is placed.

GG. Arrangement and Routing:

1. Arrange multiple conduit runs substantially in accordance with any details shown on the Drawings and as required in Figure 310-60 of the California Electric Code. Locate underground conduits where indicated on the Drawings.
2. Make minor changes in location or cross-section as necessary to avoid obstructions or conflicts. Where raceway runs cannot be installed substantially as shown because of

conditions not discoverable prior to digging of trenches, refer the condition to the County Representative for instructions before further work is done.

3. Where other utility piping systems are encountered or being installed along a raceway route, maintain a 12 inch minimum vertical separation between raceways and other systems at crossings. Maintain a 12 inch minimum separation between raceways and other systems in parallel runs unless otherwise noted. Do not place raceways over valves or couplings in other piping systems. Refer conflicts with these requirements to the County Representative for instructions before further work is done.

4. Provide bell-ends flush with manhole walls on all nonmetallic raceways entering manholes.

5. In multiple conduit runs, stagger raceway coupling locations so that couplings in adjacent raceways are not in the same transverse line.

6. All communications conduits must enter communications manholes and pull boxes from the ends only.

HH.

3.3 PRODUCT APPLICATION - RACEWAY - GENERAL LOCATIONS

A. Underground

1. Conduit:

a. PVC Coated Rigid Metal Conduit.

1) Wrap connection point of fitting and conduit to maintain integrity of coating system.

b. Rigid Nonmetallic conduit.

2. Encase underground conduits to 5 feet of building concrete where passing under roadways.

3. Install underground conduit 30 inches minimum below grade unless otherwise noted. Do not backfill before observation by the County Representative.

4. Separate conduit from face to face by 3 inches.

5. Make transition from underground rigid non-metallic conduit to rigid metal conduit after entering but prior to exiting the concrete slab. If during this transition the metal conduit comes in contact with the earth, then PVC coated rigid metal conduit must be installed.

B. Outdoors, Above Grade:

1. Do not install in exercise yards unless specifically indicated.

2. Liquid-tight Flexible Conduit:
    a. Where greater than 12 feet above grade in exercise yard where allowed.
    b. Other locations where protected from physical damage.
    c. Maximum 3 foot lengths.
3. Electrical Metallic Tubing:
    a. Do not use in exercise yards.
    b. Where protected from weather and physical damage.
4. Rigid Metallic Conduit:
    a. Use in exercise yard where allowed.
    b. Other locations not otherwise indicated.

C. In Slabs and Masonry:
1. Rigid metal conduit.
2. Rigid nonmetallic conduit.
3. PVC coated rigid conduit.
4. Conduits to be installed in precast concrete during casting and through extruded concrete planks.
5. Install no conduit larger than 1 inch in floor slabs on grade.
    a. Where installed in composite floors, conduit runs shall have no crossovers.
    b. Do not install conduit under pads for fans, pumps, boilers, or other machinery.
6. Install expansion joint fittings on conduit in slab at all building expansion joints. Allow for the high rate of thermal expansion and contraction of PVC conduit by providing PVC expansion joints as recommended by the manufacturer and as required.
7. In concrete floor slabs, not on grade:
    a. Install conduits so that the structural strength of the slab is not impaired.
    b. Install conduit in the middle one-third of the slab except as necessary to avoid structural reinforcement material and maintain at least 1 inch of cover.
    c. Provide minimum spacing of 3 diameters except at cabinet and panel locations.
    d. Do not cross conduits.

e. Place conduit larger than 1 inch parallel with or at right angles to reinforcement.

D. Dry Locations - Concealed:

1. Rigid metal conduit.

2. Flexible metal conduit.

3. Liquidtight flexible metal conduit.

4. Electrical metallic tubing.

5. Connections and Fittings:

a. Above lay-in tile ceilings, make connections to lay-in type fixtures with 1/2-inch flexible metal conduit.

1) Include No. 12 branch and grounding conductors.

2) Arrange conduit and box systems for easy removal of lay-in ceiling.

E. Dry Locations - Exposed.

1. Rigid metal conduit.

2. Flexible metal conduit - 6 feet maximum length.

3. Liquidtight flexible metal conduit - 6 feet maximum length.

4. Electrical metallic tubing.

5. Inmate Accessible Areas: Rigid metal conduit only.

3.4 PRODUCT APPLICATION - RACEWAY - SPECIAL LOCATIONS

A. The following requirements modify the general location requirements listed above.

B. Hazardous Locations:

1. Rigid Metal Conduit.

2. Flexible Metallic Conduit: As limited by CEC.

3. Liquidtight flexible metallic conduit: As limited by CEC.

4. Use sealing fittings. Fill with sealant in accordance with manufacturers instructions. Install in accord with CEC.

C. Corrosive Areas:

1. PVC coated rigid metal conduit.

2. Liquidtight flexible metal conduit.

D. Motor Connections:

1. Make motor and equipment connections with flexible metal conduit not exceeding 24 inches in length.

a. Use liquidtight metal conduit in damp and wet locations.

b. Damp locations include but are not limited to: Dietary production, dishwashing, decontamination sterilizers and pumps.

E. Freezer and Refrigeration Rooms:

1. Rigid metal conduit.

2. Use sealing fittings on refrigeration and freezer room conduit runs in accord with CEC 300-7(a).

F. Hospitals, Clinics and Health Facilities

1. The use of rigid non-metallic conduit is to be restricted to areas only indicated on the Non-metallic Conduit Guideline as detailed on the Drawings. Do not use rigid non-metallic conduit without a Non-metallic Conduit Guideline Detail.

3.5 PRODUCT APPLICATIONS - CONNECTIONS

A. Rigid Metal Conduit:

1. At building expansion joints, use expansion type fittings.

2. Where an expansion type fitting is not required, use a threaded rigid metal conduit coupling or “Erickson” type coupling as appropriate.

3. Make connections to NEMA 12 boxes with a threaded hub.

4. Make connections to a threadless opening with locknuts on the inside and outside of the box. The conduit end shall be fitted with an insulating bushing. In wet locations, a sealing gasket shall be provided between the outside locknut and the box.

5. Bonding type locknuts shall be used where the raceway and associated fittings are part of the equipment grounding system.

6. Insulated grounding and bonding bushings shall be used to terminate service conduits, rigid metal conduit used as the grounding electrode conductor enclosure, where assurance of electrical continuity between isolated sections of raceways is required in accordance with CEC and where a bonding jumper around unpunched knockouts is required in accordance with CEC.

7. Terminate in sealing type fittings when leaving refrigerator and freezer boxes and when leaving hazardous areas.

8. Repair any marred galvanized finish to maintain the same level of corrosion protection.

B. PVC Coated Rigid Metal Conduit:

1. Tape over all connections below grade to maintain the continuity of the corrosion protection.

2. Repair any damaged PVC covering of the conduit or fittings.

3. The requirements for rigid metal conduit also apply.

C. Flexible Metal Conduit:

1. Terminate with a flexible metal conduit connector. Use a locknut in unthreaded boxes.

D. Liquidtight Flexible Metal Conduit:

1. Terminate with a liquidtight flexible metal conduit connector. Use external bonding type with equipment bonding jumper in hazardous locations (where allowed). Fasten bonding jumper to conduit with cable ties every foot.

2. In wet locations, use a sealing gasket.

E. Electrical Metallic Tubing:

1. At building expansion joints, use expansion type fittings.

2. Where an expansion type fitting is not required, use an EMT coupling to connect EMT sections.

3. Make connections with EMT connectors.

F. Rigid non-metallic conduit:

1. Make connections in accordance with the manufacturers published instructions.

G. System-to-System Connections:

1. Make EMT to rigid metal conduit connections with an EMT to rigid metal conduit connector.

2. Make a box-to-box connection with a “chase” type nipple and locknut.

3.6 PREPARATION FOR PULLING IN CONDUCTORS

A. Do not install crushed or deformed raceways. Avoid traps in raceways where possible. Take care to prevent the lodging of plaster, concrete, dirt, or trash in raceways, boxes, fittings,

and equipment during the course of construction. Make raceways entirely free of obstructions. Raceways that are not usable because of being crashed or obstructions shall be replaced. Ream all raceways, remove burrs, and clean raceway interior before introducing conductors or pull wires.

B. Immediately after installation, plug or cap all raceway ends with watertight and dust-tight seals until the time for pulling in conductors. Provide a permanent removable cap over each end of each empty raceway.

3.7 EMPTY RACEWAYS

A. Certain raceways will have no conductors pulled in as part of this Contract. Identify with tags at each end the origin and destination of each such empty raceway. Provide a permanent cap over each end of each empty raceway. Provide a nylon pull wire in each empty raceway, tie-off at both ends.

3.8 TESTING & INSPECTION

A. Do not cover up conduit work until inspected. Notify the County representative at least 3 days before inspection is desired.

3.9 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

3.10 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.11 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

B. All conduuits shall be run concealed in walls and/or ceiling. Where conduits can not be run concealed in wall and/or ceiling space, the Constractor shall coordinate with the architectural and structural plans and the Architect for installing and routing of exposed conduits.

3.12 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

END OF SECTION

SECTION 26 05 33.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C. Floor boxes.

D. Underground boxes/enclosures.

E. Wall and ceiling outlet boxes.

F. Floor boxes.

G. Pull and junction boxes.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

C. Section 26 05 33.13 - Conduit for Electrical Systems:

1. Conduit bodies and other fittings.

2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

D. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 2716 - Electrical Cabinets and Enclosures.

G. Section 26 2726 - Wiring Devices: Wall plates in finished areas.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2010.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports 2013.

F. California Electrical Code (CEC) - 2022

G. SCTE 77 - Specification for Underground Enclosure Integrity 2017.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.

J. UL 508A - Industrial Control Panels Current Edition, Including All Revisions.

K. UL 514A - Metallic Outlet Boxes Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by CEC.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to CEC.

4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to CEC.

5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.

6. Coordinate the work with other trades to preserve insulation integrity.

7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.

8. Field Measurements

a. Verify field measurements are as shown on the Drawings.

b. Boxes are indicated in approximate locations unless dimensioned. Verify locations prior to rough-in.

c. Coordinate mounting heights and locations of boxes mounted above, below, in, or on counters, benches and backsplashes.

d. Coordinate cutting of masonry to achieve neat installation.

e. Provide access panels in ceilings, partitions, enclosures, etc. as required in order to achieve easy access to all equipment and devices provided or installed under Division 26 Work. Many access panel locations may be indicated on the Drawings. Provide additional access panels as required.

1) For non-security walls, partitions, ceilings, enclosures, etc.: Provide non-security access panels as Work of Division 26 Requirements for access doors/panels are specified in Section 08 31 00.

2) For security walls, partitions, ceilings, enclosures, etc.: Provide security access panels as Work of Division 26 Requirements for security access panels are specified in Section 08 31 00.

9. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.

C. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.

D. Maintenance Materials: Furnish the following for the County's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Keys for Lockable Enclosures: Two of each different key.

1.6 QUALITY ASSURANCE

A. Comply with requirements of CEC.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 BOXES

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by CEC and product listing.

2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.

3. Provide products listed, classified, and labeled as suitable for the purpose intended.

4. Where box size is not indicated, size to comply with CEC but not less than applicable minimum size requirements specified.

5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.

3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.

4. Use suitable concrete type boxes where flush-mounted in concrete.

5. Use suitable masonry type boxes where flush-mounted in masonry walls.

6. Use raised covers suitable for the type of wall construction and device configuration where required.

7. Use shallow boxes where required by the type of wall construction.

8. Do not use "through-wall" boxes designed for access from both sides of wall.

9. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.

10. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.

11. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.

12. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.

13. Minimum Size: 4 inches square; 2-1/2 inches deep at ceilings; 3-1/2 inches deep at concrete or masonry walls; 2-1/8 inches deep with a raised 1-inch device cover at metal stud walls.

    a. Use of 2-1/2-inch deep single gang boxes shall be permitted when there is only one conduit entry into the box.

14. Wall Plates: Comply with Section 26 27 26.

15. Manufacturers:

    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.

    b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com/#sle.

    c. Thomas & Betts Corporation: www.tnb.com/#sle.

    d. Or equal.

    e. Substitutions: See Section 01 60 00 - Product Requirements.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:

1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.

2. NEMA 250 Environment Type, Unless Otherwise Indicated:

    a. Indoor Clean, Dry Locations: Type 1, painted steel.

    b. Outdoor Locations: Type 3R, painted steel.

3. Junction and Pull Boxes Larger Than 100 cubic inches:

    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:

    a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.

    b. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.

5. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

6. Surface-Mounted: NEMA 250, Type 4; flat-flanged.

    a. Material: Galvanized cast iron or steel.

b. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

7. In-Ground Cast: NEMA 250, Type 6, outside or inside flanged, as required recessed cover box for flush mounting.

   a. Material: Galvanized cast iron.

   b. Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.

   c. Cover Legend: ELECTRIC.

8. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.

9. Manufacturers:

   a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.

   b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com/#sle.

   c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com/#sle.

   d. Or equal.

   e. Substitutions: See Section 01 60 00 - Product Requirements.

D. FLOOR BOXES

1. Stamped Steel - Watertight

   a. NEMA OS 1, fully adjustable, stamped steel with galvanized finish or cast metal, rectangular, and shall accept a standard duplex receptacle, data or communications device.

      1) For concrete pours 3 inches and greater

         a) Box shall have a 1-1/4-inch prior to and 3/8-inch after pour vertical and angular adjustment.

         b) Box shall have six 3/4-inch and nine 1/2-inch knockouts.

         c) Minimum box capacity shall be 36 cubic inches.

         d) Box shall have a removable top for conduit connections.

      2) For concrete pours 4 inches and greater:

         a) Box shall have 1-1/4-inch prior to and 3/8-inch after pour vertical and angular adjustment.

b) Box shall have two 1-1/4-inch, two 1-inch, four 3/4-inch and five 1/2-inch knockouts.

c) Minimum box capacity shall be 53 cubic inches.

2. Cast Iron - Concrete Tight

a. For concrete pours, 3 inches and greater:

1) Box shall be cast iron with a gray polyester corrosion-resistant finish.

a) Box shall have a removable top for conduit connections.

2) For shallow pours, 2 inches and greater:

a) Box shall be cast iron and semi-adjustable type.

3. Covers

a. For stamped steel and cast iron, round and rectangular:

1) Covers shall be brushed brass and able to be mounted to the aforementioned boxes.

a) Flush mounted, suitable for single, duplex receptacle, data and communications devices.

E. Underground Boxes/Enclosures:

1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.

2. Size: As indicated on drawings.

3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.

4. Provide logo on cover to indicate type of service.

5. Applications:

a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.

b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 22 load rating.

c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.

6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.

    a. Manufacturers:

        1) Hubbell Incorporated; Quazite Products: www.hubbellpowersystems.com/#sle.

        2) MacLean Highline: www.macleanhighline.com/#sle.

        3) Oldcastle Precast, Inc: www.oldcastleprecast.com/#sle.

        4) Or equal.

        5) Substitutions: See Section 01 60 00 - Product Requirements.

    b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify locations of floor boxes and outlets prior to rough-in.

E. Verify locations of all boxes required for equipment with kitchen consultant plans and specifications.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, except for mounting heights specified in those standards.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and CEC.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:

1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.
2. Unless dimensioned, box locations indicated are approximate.
3. Locate boxes as required for devices installed under other sections or by others.
    a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.
4. Locate boxes so that wall plates do not span different building finishes.
5. Locate boxes so that wall plates do not cross masonry joints.
6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
    a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
    b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.
11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    a. Concealed above accessible suspended ceilings.
    b. Within joists in areas with no ceiling.
    c. Electrical rooms.
    d. Mechanical equipment rooms.

I. Box Supports:

1. Secure and support boxes in accordance with CEC and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide required seismic controls in accordance with Section 26 05 48.

3. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with CEC. Do not provide support from piping, ductwork, or other systems.

4. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:

1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.

2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.

3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

L. Install boxes as required to preserve insulation integrity.

M. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

N. Underground Boxes/Enclosures:

1. Install enclosure on gravel base, minimum 6 inches deep.

2. Flush-mount enclosures located in concrete or paved areas.

3. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.

4. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

O. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

Q. Close unused box openings.

R. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

S. Provide grounding and bonding in accordance with Section 26 05 26.

T. Identify boxes in accordance with Section 26 05 53.

U. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.

V. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 72.

W. Coordinate installation of outlet boxes for equipment connected under Section 26 27 29.

X. Set wall mounted boxes at elevations to accommodate mounting heights indicated.

Y. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.

1. Adjust box locations up to 10 feet if required to accommodate intended purpose.

Z. Orient boxes to accommodate wiring devices oriented as specified in Section 26 2726.

AA. Maintain headroom and present neat mechanical appearance.

BB. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

CC. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

DD. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

EE. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

FF. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.

GG. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

HH. Use flush mounting outlet box in finished areas.

II. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

JJ. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in fire-rated and acoustic rated walls.

KK. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

LL. Use stamped steel bridges to fasten flush mounting outlet box between studs.

MM. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

NN. Use adjustable steel channel fasteners for hung ceiling outlet box.

OO. Do not fasten boxes to ceiling support wires.

PP. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

QQ. Use gang box where more than one device is mounted together. Do not use sectional box.

RR. Use gang box with plaster ring for single device outlets.

SS. Use cast outlet box in exterior locations exposed to the weather and wet locations.

TT. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

UU. Set floor boxes level.

VV. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

WW. At masonry walls and partitions, locate flush mounting box at corner of block to reduce cutting.

XX. Outlet Boxes

1. Minimum Size: 4 inches square; 2-1/2 inches deep at ceilings; 3-1/2 inches deep at walls.
    a. Exception: 2-1/2 inches deep box allowed if allowed if rebar or other obstructions prevents the use of deeper boxes.
    b. Exception: Single gang 3-1/2 inches deep boxes shall be used in masonry walls when single gang backing plates for single gauge security device plates are provided by others.
2. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

YY. APPLICATION

1. Exterior
    a. In-ground: Provide in-ground cast box with cover.
        1) Above-ground: Provide cast box.
2. Interior

a. Finished Areas: Provide flush-mounted boxes.

1) Interior Unfinished Areas: Provide flush or surface-mounted boxes, except that exposed surface-mounted boxes will not be acceptable in inmate accessible areas.

2) Floor Boxes:

a) Cast iron boxes shall be used in slabs on grade level or below.

b) Stamped steel boxes shall be used in slabs above grade level.

3. Pull Boxes Larger than 100 Cubic Inches in Volume or 12 Inches in Any Dimension:

a. 1. Dry Locations: Provide hinged enclosure under provisions of Section 26 27 16.

1) At stud walls and partitions, install box and plaster ring allowing for thickness of surface finish. Provide boxes for luminaires and electrical connections to equipment shown on Drawings.

2) For 1-gang outlets in non-masonry walls, use four-inch square box with four-inch square plaster ring with 1-gang opening.

a) Boxes smaller than four-inches square not permitted.

3) For 2-gang outlets, use four-inch square box with four-inch square plaster ring with 2-gang opening.

a) When normal and emergency circuits are in same box, provide barrier between them.

4. Use gang box where more than one device is mounted together. Do not use sectional box. Provide box with interior barrier for devices on normal and emergency power which are mounted together. In addition, provide barriers where the voltage between adjacent switches exceeds that which is allowed by the CEC.

3.3 ADJUSTING

A. Adjust floor boxes flush with finish flooring material.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closures in unused box openings.

3.4 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.5 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 26 05 41 - SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Surface metal raceways.
    a. Multi-outlet assemblies.
    b. Wireway.
    c. Wall duct.
2. Related Documents and Sections
    a. Section 26 01 10 - Electrical General Requirements
    b. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
    c. Section 26 05 29 - Hangers and Supports for Electrical Systems.
    d. Section 26 27 26 - Wiring Devices.

B. REFERENCES

1. NEMA WD 6-2002 - Wiring Devices - Dimensional Requirements.

C. SUBMITTALS

1. Submit under provisions of Division 1.
2. Product Data
    a. Provide dimensions, knockout sizes and locations, materials, fabrication details, finishes, and accessories.
    b. Submit documentation confirming compliance with regulatory requirements.

D. QUALITY ASSURANCE/CONTROL SUBMITTALS

1. Manufacturer’s Instructions: Indicate application conditions and limitations of use stipulated by UL or other nationally recognized testing laboratory. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

E. QUALITY ASSURANCE

1. Perform Work in accordance with NECA Standard of Installation.

PART 2 PRODUCTS

2.1 SURFACE METAL RACEWAY

A. Description: Sheet metal channel with fitted cover, suitable for use as surface metal raceway.

B. Size: As shown on Drawings.

C. Finish: Gray enamel.

D. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories.

2.2 MULTI-OUTLET ASSEMBLY

A. Multi-outlet Assembly: Sheet metal channel with fitted cover, with pre-wired receptacles, suitable for use as multi-outlet assembly.

B. Size: As indicated on Drawings.

C. Receptacles:

1. Provide covers and accessories to accept receptacles specified in Section 26 27 26 or, if not shown on drawings, provide:

2. NEMA WD 6, type 5-20R, single receptacle.

3. Receptacle Spacing: 18 inches on center or as indicated.

4. Receptacle Color: Gray.

5. Emergency Receptacle Color: Red.

6. Channel Finish: Gray enamel.

7. Fittings: Furnish manufacturer's standard couplings, elbows, outlet and device boxes, and connectors.

2.3 WIREWAY

A. Description: NEMA 12 gasketed type wireway.

B. Knockouts: Manufacturer's standard.

C. Size: As indicated on Drawings.

D. Cover: Hinged cover with full gasketing.

E. Connector: Slip-in.

F. Fittings: Lay-in type with removable top, bottom, and side; captive screws.

G. Finish: Rust inhibiting primer coating with gray enamel finish.

2.4 WALL DUCT

A. Description: Sheet metal wall duct rated for installation of X-ray cables; with surface covers and accessories.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Mount plumb and level.

1. Use flat-head screws, clips, and straps to fasten raceway channel to surfaces.

2. Use tamper proof metal fasteners in inmate accessible areas in accordance with Section 11 98 16.

C. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

D. Wireway Supports: Provide steel channel as specified in Section 26 05 29.

E. Close ends of wireway and unused conduit openings.

F. Ground and bond raceway and wireway under provisions of Section 26 05 26.

END OF SECTION

SECTION 26 05 48 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Anchoring and restraints.

2. Related Sections

a. Section 26 01 10 - Electrical General Requirements.

b. Section 26 05 29 - Hangers and Supporters for Electrical Systems.

B. REFERENCES

1. ASTM E2265-2003 - Standard Terminology for Anchors and Fasteners in Concrete and Masonry.

C. SYSTEM DESCRIPTION

1. Design Requirements

a. Provide the work in compliance with CCR Title 24, Part 2, State Chapters. Drawings and calculations to be stamped and signed by a California licensed structural engineer.

b. Provide seismic zone 4 restraints for the listed materials and equipment. The attachments shall resist forces to the center of gravity of the component. Criteria shall be the operating weight of the item times 0.5g for horizontal force to be applied in any direction. Wall-mounted or suspended components shall in addition, resist a downward force of 200 pounds minimum added to the operating weight.

D. SUBMITTALS

1. Submit under provisions of Division 1.

2. Submit proposed system to the County Representative for review prior to installation.

3. Project Information:

a. Static seismic zone 4 calculations for all electrical equipment and conduit where isolation restraints are supplied.

b. Calculations performed by a professional structural engineer licensed in the state of California.

c. Certification of seismic zone 4 restraints.

1) Substantiated by calculations or test reports verified by a professional structural engineer licensed in the State of California.

4. Shop Drawings

a. Submit lighting fixture installation shop drawing for approval prior to installation.

E. QUALITY ASSURANCE

1. SMACNA Guidelines for seismic zone 4 restraints of mechanical systems and plumbing piping systems.

2. Anchor Bolts: ASTM A307

PART 2 PRODUCTS

2.1 GENERAL

A. Acceptable Manufacturers:

1. Seismic Zone 4 Control Devices

a. Mason Industries.

b. Vibration Eliminator Co.

c. Korfund Dynamics Corp.

d. Amber-Booth Co.

e. Consolidated Kinetics.

B. Provide conduit and equipment anchoring systems as indicated in the Contract Documents.

C. Provide all mounting hardware, support wires, conduits for alignment, eyebolts, bolts, nuts and washers required for equipment mounting and seismic zone 4 control. Structural blocking/backing and hardware required for installation shall be provided as indicated in the Contract Documents.

2.2 ANCHORING AND RESTRAINTS

A. Equipment Anchors:

1. Anchor all equipment in accordance with the approved shop drawings.

2. Contractor shall be responsible for design and acquiring of approval for anchoring of equipment which varies from the design.

B. Conduit Supports:

1. Conduits shall be supported and braced in accordance with SMACNA Guidelines.

2. Conduit weights shall be as listed for same size pipes full of water as listed in SMACNA Guidelines.

C. Lighting Fixture Supports:

1. Provide independent seismic zone 4 support system for all fixtures not directly anchored to concrete walls or concrete ceilings.

D. Motor Control Centers Supports:

1. Support per certifications.

E. Floor Mounted Switchgear:

1. Support per certifications.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturers' written instructions in a manner to achieve full capacity of support.

END OF SECTION

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Nameplates.
    a. Wire markers.
    b. Conduit and electrical markers.
    c. Buried utility tape.

B. QUALITY ASSURANCE

1. Regulatory Requirements
    a. Furnish products listed and classified by UL as suitable for purpose specified and shown.
    b. Compliance with the CEC and in particular, Article 110.

PART 2 PRODUCTS

2.1 NAMEPLATES

A. Description

1. Nameplates: Engraved three-layer laminated plastic, white letters on black background.
2. Letter Size:
    a. Use 1/8-inch letters for identifying individual equipment and loads.
    b. Use 1/4-inch letters for identifying grouped equipment and loads.

2.2 WIRE MARKERS

A. Manufacturers:

1. Brady.
2. E-Z Code by T&B.
3. Pan-Code by Panduit.
    a. Plymark by Plymouth and Bishop.

4. ScotchCode by 3M.
5. Ideal.

B. Description:

1. Vinyl cloth, self laminating vinyl, heat shrink sleeving, or tube type markers.
2. Legend:
   a. Power and Lighting Circuits: Branch circuit or feeder number indicated on Drawings.
   b. Control Circuits: Control wire number indicated on shop drawings.

2.3 CONDUIT AND ELECTRICAL MARKERS

A. Manufacturers:

1. E-Z Code by T&B.
2. Pan-Code by Panduit.
3. Ideal.

B. Description: Tape, 2 inches wide.

C. Legend and Color:

1. Black Lettering on Orange Background.
   a. All voltages.
   b. Emergency Electrical System: “EMERGENCY” Black lettering on orange background.
2. White Lettering on red background.
   a. Fire Alarm System: “FIRE”
3. White Lettering on Blue Background.
   a. Telephone system: “TELE”
   b. Correctional management information system, “DWI”
   c. Spare communications, “SPARE.”

2.4 BURIED UTILITY TAPE

A. Manufacturers:

1. E-Z Code by T&B.
2. Pan-Code by Panduit.
3. Terra Tape.

B. Description: 6inch wide plastic tape, detectable type, colored red with warning legend: “HIGH VOLTAGE LINE”.

PART 3 EXECUTION

3.1 PREPARATION

A. Surface Preparation

1. Degrease and clean surfaces to receive nameplates, wire markers, conduit and electrical markers.

3.2 APPLICATION

A. Nameplates

1. Provide nameplates for electrical equipment, such as distribution panels, sub panels, transformers, and disconnects.
2. Recessed Panelboards: Install nameplate with metal screws to inside surface of door.

B. Wire Markers.

1. Provide for each conductor at panelboard, gutter, pull box, junction box, convenience outlet, cabinet, and each load connection.
2. For feeder and branch circuits, use circuit numbers indicated on the Drawings. For control circuits, use circuit numbers indicated on the shop drawings.

C. Above Grade Conduit

1. Provide conduit/electrical markers for all exposed conduits, longer than 20 feet, which pass through a room or any open area without terminating.
    a. Mark conduit every 20 feet.
2. Interior or exterior located mechanical equipment: Provide conduit/electrical markers to distinguish voltage differences when fed by two or more conduits.

D. Below Grade Conduit or Utility Duct

1. Provide utility tape for entire length of conduit or duct.
    a. Install utility tape 12 inches maximum above conduit or duct.

END OF SECTION

SECTION 26 05 73 - POWER SYSTEM STUDIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Short-circuit study.

B. Protective device coordination study.

C. Arc flash and shock risk assessment.

1. Includes arc flash hazard warning labels.

D. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

1.2 RELATED REQUIREMENTS

A. Section 26 05 53 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

B. Section 262413 Switchboards/Distribution Panel.

C. Section 26 24 16 - Panelboards.

D. Section 26 28 13 - Fuses.

1.3 REFERENCE STANDARDS

A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels 2011.

B. IEEE 141 - IEEE Recommended Practice for Electrical Power Distribution for Industrial Plants 1993 (Reaffirmed 1999).

C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems 2001, with Errata (2003).

D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis 1997.

E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems 2006.

F. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations 2018, with Errata (2019).

G. NEMA MG 1 - Motors and Generators 2018.

H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.

I. California Electrical Code (CEC) - 2022

J. NFPA 70E - Standard for Electrical Safety in the Workplace 2021.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.

2. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Submit study reports prior to or concurrent with product submittals.

2. Do not order equipment until matching study reports and product submittals have both been evaluated by Architect/Engineer.

3. Verify naming convention for equipment identification prior to creation of final drawings, reports, and arc flash hazard warning labels (where applicable).

1.5 SUBMITTALS

A. Study preparer's qualifications.

B. Study reports, stamped or sealed and signed by study preparer.

C. Product Data: In addition to submittal requirements specified in other sections, include manufacturer's standard catalog pages and data sheets for equipment and protective devices indicating information relevant to studies.

1. Include characteristic time-current trip curves for protective devices.

2. Include impedance data for busway.

3. Include impedance data for engine generators.

4. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.

5. Include documentation of listed series ratings.

6. Identify modifications made in accordance with studies that:

a. Can be made at no additional cost to the owner.

b. As submitted will involve a change to the contract sum.

D. Arc Flash Hazard Warning Label Samples: One of each type and legend specified.

E. Site-specific arc flash hazard warning labels.

F. Field quality control reports.

G. Certification that field adjustable protective devices have been set in accordance with requirements of studies.

H. Project Record Documents: Revise studies as required to reflect as-built conditions.

1. Include hard copies with operation and maintenance data submittals.

2. Include computer software files used to prepare studies with file name(s) cross-referenced to specific pieces of equipment and systems.

1.6 POWER SYSTEM STUDIES

A. Scope of Studies:

1. Perform analysis of new electrical distribution system.

2. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).

3. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.

a. Known Operating Modes:

1) Utility as source.

2) Generator as source.

B. General Study Requirements:

1. Comply with CEC.

2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

C. Data Collection:

1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.

a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.

1) Obtain up-to-date information from Utility Company.

b. Generators: Include manufacturer/model, kW and voltage ratings, and impedance.

c. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 1 code letter designation.

d. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.

e. Protective Devices:

1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).

2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).

f. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.

g. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.

D. Short-Circuit Study:

1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.

2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:

a. Maximum utility fault currents.

b. Maximum motor contribution.

c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.

E. Protective Device Coordination Study:

1. Comply with applicable portions of IEEE 242 and IEEE 399.

2. Analyze alternate scenarios considering known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

3. Analyze protective devices and associated settings for suitable margins between time-current curves to provide adequate protection for equipment and conductors while achieving full selective coordination.

F. Arc Flash and Shock Risk Assessment:

1. Comply with NFPA 70E.

2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.

3. For equipment with main devices mounted in separate compartmentalized sections, perform calculations on both the line and load side of the main device.

4. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:

a. Maximum and minimum utility fault currents.

b. Maximum and minimum motor contribution.

c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

G. Study Reports:

1. General Requirements:

a. Identify date of study and study preparer.

b. Identify study methodology and software product(s) used.

c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.

d. Identify base used for per unit values.

e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.

f. Include conclusions and recommendations.

2. Short-Circuit Study:

a. For each scenario, identify at each bus location:

1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).

2) Fault point X/R ratio.

3) Associated equipment short circuit current ratings.

b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.

3. Protective Device Coordination Study:

   a. For each scenario, include time-current coordination curves plotted on log-log scale graphs.

   b. For each graph include (where applicable):

      1) Partial single-line diagram identifying the portion of the system illustrated.

      2) Protective Devices: Time-current curves with applicable tolerance bands for each protective device in series back to the source, plotted up to the maximum available fault current at the associated bus.

      3) Conductors: Damage curves.

      4) Transformers: Inrush points and damage curves.

      5) Generators: Full load current, overload curves, decrement curves, and short circuit withstand points.

      6) Motors: Full load current, starting curves, and damage curves.

      7) Capacitors: Full load current and damage curves.

   c. For each protective device, identify fixed and adjustable characteristics with available ranges and recommended settings.

      1) Circuit Breakers: Include long time pickup and delay, short time pickup and delay, and instantaneous pickup.

      2) Include ground fault pickup and delay.

      3) Include fuse ratings.

      4) Protective Relays: Include current/potential transformer ratios, tap, time dial, and instantaneous pickup.

   d. Identify cases where either full selective coordination or adequate protection is not achieved, along with recommendations.

4. Arc Flash and Shock Risk Assessment:

   a. For the worst case for each scenario, identify at each bus location:

      1) Calculated incident energy and associated working distance.

      2) Calculated arc flash boundary.

      3) Bolted fault current.

4) Arcing fault current.

5) Clearing time.

6) Arc gap distance.

b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.

1.7 QUALITY ASSURANCE

A. Study Preparer Qualifications: Professional electrical engineer licensed in California and with minimum five years experience in the preparation of studies of similar type and complexity using specified computer software.

1. Study preparer may be employed by manufacturer of electrical distribution equipment.

B. Field Testing Agency Qualifications: Independent testing organization specializing in testing, analysis, and maintenance of electrical systems with minimum five years experience; NETA Accredited Company.

1. Field Supervisor: Certified electrical testing technician; NETA ETT Level III.

C. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.

1. Products:

a. EasyPower LLC: www.easypower.com/#sle.

b. ETAP/Operation Technology, Inc: www.etap.com/#sle.

c. Power Analytics Corporation: www.poweranalytics.com/#sle.

d. SKM Systems Analysis, Inc: www.skm.com/#sle.

D. Responsibility: Provide all project-related data needed by study preparer, including equipment, wire sizes, insulation types, conduit types, and actual circuit lengths.

PART 2 PRODUCTS

2.1 ARC FLASH HAZARD WARNING LABELS

A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.

1. Materials: Comply with Section 26 05 53.

2. Minimum Size: 4 by 6 inches.

3. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.

    a. Include orange header that reads "WARNING" unless otherwise indicated.

    b. Include the text "Arc Flash and Shock Hazard; Appropriate PPE Required" or approved equivalent.

    c. Include the following information:

        1) Arc flash boundary.

        2) Available incident energy and corresponding working distance.

        3) Site-specific PPE (personnel protective equipment) requirements.

        4) Nominal system voltage.

        5) Limited approach boundary.

        6) Restricted approach boundary.

        7) Equipment identification.

        8) Study preparer, report reference, and date calculations were performed.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install arc flash warning labels in accordance with Section 26 05 53.

3.2 FIELD QUALITY CONTROL

A. Provide the services of field testing agency to perform inspection, testing, and adjusting.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Adjust equipment and protective devices for compliance with studies and recommended settings.

D. Notify Architect/Engineer of any conflicts with or deviations from studies. Obtain direction before proceeding.

E. Submit detailed reports indicating inspection and testing results, and final adjusted settings.

3.3 CLOSEOUT ACTIVITIES

A. Training: Include as part of the base bid training for the County's personnel on electrical safety pertaining to arc flash and shock hazards.

B. Training: Include as part of the base bid training for county's personnel on electrical safety pertaining to arc flash and shock hazards.

1. Use site-specific arc flash and shock risk assessment report as training reference, supplemented with additional training materials as required.
2. Provide minimum of eight hours of training.
3. Instructor: Representative of entity performing study.
4. Location: At project site.

END OF SECTION

SECTION 26 08 13 - ACCEPTANCE TESTING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Quality assurance.

   a. Field quality control.

2. Related Sections

   a. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

   b. Section 26 24 13 - Switchboards.

   c. Section 26 24 16 – Panelboards.

B. REFERENCES

1. Refer to requirements of Section 26 01 10.

2. International Electrical Testing Association (NETA)

   a. ATS - Acceptance Testing Associations for Electrical Power Distribution Equipment and Systems.

3. California Building Energy Efficiency Standards (CBEES)

   a. Lighting Control Acceptance Requirements (130.4(a))

   b. Lighting Control Installation Certificate Requirements (130.4(b))

C. SYSTEM DESCRIPTION

1. Performance Requirements

   a. Inspections and tests shall be performed in accordance with applicable codes and standards including CEC, ANSI, IEEE, NFPA, and NEMA as referenced in the related Sections.

   b. Acceptance testing shall be performed on all indoor and outdoor lighting controls serving the Group B Occupancy and shall be certified as meeting the Acceptance Requirements for Code Compliance in accordance with CBEES Section 130.4(a).

D. SUBMITTALS

1. Submit under provisions of Division 1.

2. Quality Assurance/Control Submittals

    a. Test Reports: Certified test reports shall be submitted at the completion of the project. The final report shall be signed and include the following information:

        1) Summary of the project.

        2) Description of the equipment tested.

        3) Visual inspection report.

        4) Description of the tests.

        5) Test results.

        6) Conclusions and recommendations.

        7) Appendix including appropriate test forms.

        8) Identification of the test equipment used.

        9) Name of Company & individual conducting tests.

    b. After the evaluation of the system and equipment has been made, the testing organization shall submit for approval an acceptance test procedure for each item of electrical distribution equipment to be tested on this project. Test procedures shall include the proposed system function test. No testing shall be performed unless the test procedures have been approved.

3. Qualification Statements: The qualifications of the testing organization and field engineer responsible for the testing shall be submitted for approval prior to the start of the testing.

4. Contractor shall submit proof of current Acceptance Test Technician certification by the California Energy Commission during the bid process.

5. CBEES Lighting Control Acceptance and Installation Certificate Form Submittal

    a. The Contractor shall complete the required Nonresidential Certificates of Installation (NRCI) forms and shall submit them to the Authority Having Jurisdiction to demonstrate the lighting installations are compliant with the Energy Code.

    b. Certified Acceptance Test Technician (ATT) shall complete the required Nonresidential Certificates of Acceptance (NRCA) forms to demonstrate compliance with Acceptance Testing requirements in the Energy Code. Forms ending in a “-F” shall be submitted to the inspector. Forms ending in a “-A” shall be completed by an ATT through an Energy Commission Certification Provider’s website.

E. QUALITY ASSURANCE

1. Qualifications

    a. The Contractor shall engage the services of a qualified testing organization to provide final inspection, testing, calibration and adjusting on the electrical system as defined in this Contract. The testing organization shall have been engaged in full practice for a minimum of five years.

    b. The testing organization shall have a calibration program with accuracy traceable every six months, and in an unbroken chain, the National Institute of Standards and Technology (N.I.S.T.).

    c. Testing, inspection and calibration shall be performed by an Engineering Technician, certified by a national organization with a minimum of 5 years experience inspecting, testing and calibrating electrical distribution equipment, systems and devices. Information substantiating the qualifications of the Certified Engineering Technician shall be submitted for approval prior to the start of work.

    d. The Contractor shall supply to the testing organization complete sets of approved shop drawings, coordination study, settings of all adjustable devices and other information necessary for an accurate inspection and evaluation of the system prior to the performance of any tests.

    e. Membership in the International Electrical Testing Association or equivalent organization.

    f. The Contractor shall be certified California Energy Commission to perform acceptance testing and submit all required Nonresidential Certificates of Acceptance (NRCA) on lighting controls as required by CBEES.

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide materials and equipment necessary to perform the inspection and tests.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Site Tests

1. Test under provisions of Division 1.

2. Perform tests in accordance with the latest edition of ATS.

3. Field Acceptance Testing shall be accomplished on each item of electrical equipment installed or connected to a part of this Contract. This shall include:

a. Grounding System: Perform inspection and testing as required in Section 26 05 26 and ATS.

b. Switchboards: Perform inspection and testing as required in Section 26 24 13.

c. Dry Type Transformers: Perform inspection and testing as required in Section 26 22 00.

d. Over Current Protective Device: Perform primary injection test to prove circuit breakers rated 400-amps and above.

e. AC Motors: Perform inspection and testing as required in ATS for all motors rated 10 HP and higher.

f. Motor Control: Perform inspection and testing as described in the Motor Control, Low Voltage section of ATS.

g. Meters and Associated Instrument Transformers: Perform inspection and testing described in ATS.

h. Short-Circuit Analysis and Coordination Study: Perform inspection, setting, testing and calibration of applicable devices as described in ATS.

i. Battery System: Perform inspection and testing as described in ATS.

4. All interlocks, safety devices, fail-safe functions, and design functions shall be tested.

5. Each system covered by this Section shall be function tested to ensure total system operation.

6. Upon satisfactory completion of equipment acceptance tests, the system functional tests shall be performed. Prove proper interaction of sensing, processing and action devices to effect the designed end product and results.

7. System shall be energized or otherwise placed in service only after completion of all required tests and an evaluation of the test results has been completed.

B. Inspection

1. Visual inspection of installed equipment shall be performed by the testing organization to verify that the equipment installed and to be tested is the equipment denoted on the approved shop drawings. The inspection shall check the equipment designations, device characteristics, special installation requirements, applicable codes and standards.

2. After completion of the visual inspection, a report shall be developed stating any discrepancies that may have been found. Discrepancies shall be corrected before proceeding further with testing unless allowed in writing by the County representative.

C. Lighting Controls Acceptance Testing

1. Perform Acceptance Testing in accordance with the latest edition of BCEES.

3.2 ADJUSTING

A. Adjust work under provisions of Division 1.

B. Deficiencies found shall be rectified, and work affected by such deficiencies shall be completely retested. Final acceptance of the electrical power system is contingent upon satisfactory completion of the acceptance and system function tests.

END OF SECTION

SECTION 26 09 19 - ENCLOSED CONTACTORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General purpose contactors.

B. Lighting contactors.

1.2 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

C. Section 26 28 13 - Fuses.

1.3 REFERENCE STANDARDS

A. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts 2000, with Errata (2008).

B. NEMA ICS 6 - Industrial Control and Systems: Enclosures 1993 (Reaffirmed 2016).

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum) 2013.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.

E. California Electrical Code (CEC) - 2022

1.4 SUBMITTALS

A. Product Data: Provide dimensions, size, voltage ratings and current ratings.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Closeout Submittals

1. Project Record Documents

a. Accurately record actual locations of each contactor and indicate circuits controlled.

2. Operation and Maintenance Data

a. Submit under provisions of Division 1.

b. Maintenance Data: Include instructions for replacing and maintaining coil and contacts.

1.5 QUALITY ASSURANCE

A. Conform to requirements of CEC.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.1 GENERAL PURPOSE CONTACTORS

A. Description: NEMA ICS 2, AC general purpose magnetic contactor.

B. Coil operating voltage: 120 volts, 60 Hertz.

C. Poles: As required to match circuit configuration and control function.

D. Enclosure: NEMA ICS 6, Type 1

E. Accessories:

1. Pushbutton: ON/OFF.

2. Selector Switch: ON/OFF.

3. Indicating Light: RED.

4. Auxiliary Contacts: One, normally open.

2.2 LIGHTING CONTACTORS

A. Description: NEMA ICS 2, magnetic lighting contactor.

B. Configuration: Electrically held.

C. Coil operating voltage: 120 volts, 60 Hertz.

D. Poles: As required to match circuit configuration and control function.

E. Contact Rating: Match branch circuit overcurrent protection, considering derating for continuous loads.

F. Enclosure: NEMA ICS 6, Type 1

G. Accessories:

1. Selector Switch: ON/OFF.
2. Indicating Light: RED.
3. Auxiliary Contacts: One, normally open.

2.3 ACCESSORIES

A. Pushbuttons and Selector Switches: NEMA ICS 2, heavy duty type.

B. Indicating Lights: NEMA ICS 2, transformer type.

C. Auxiliary Contacts: NEMA ICS 2, Class A300.

2.4 DISCONNECTS

A. Combination Contactors: Combine contactor with disconnect in common enclosure.

B. Disconnects: Fusible switch assembly; NEMA KS 1, enclosed knife switch with externally operable handle. Fuse clips: Designed to accommodate Class R fuses.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install enclosed contactors where indicated, in accordance with manufacturer's instructions.

B. Install enclosed contactors plumb. Provide supports in accordance with Section 26 05 29.

C. Provide fuses for fusible switches; refer to Section 26 28 13 for product requirements.

D. Identify enclosed contactors in accordance with Section 26 05 53.

3.2 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform applicable inspections and tests listed in NETA ATS, Section 7.16.1.

END OF SECTION

SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Occupancy sensors.

B. Outdoor photo controls.

C. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems

C. Section 26 05 33.16 - Boxes for Electrical Systems.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 2716 - Electrical Cabinets and Enclosures.

F. Section 26 51 00 - Interior Lighting.

G. Section 26 56 00 - Exterior Lighting.

1.3 REFERENCE STANDARDS

A. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing 2010.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

D. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts 2016.

E. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices 2017.

F. California Electrical Code (CEC) - 2022

G. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control Current Edition, Including All Revisions.

H. UL 916 - Energy Management Equipment Current Edition, Including All Revisions.

I. UL 917 - Clock-Operated Switches Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.

3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.

4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.

5. Notify the Architect and/or the District Representative of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install lighting control devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

B. Shop Drawings:

1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.

2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.

C. Samples:

1. Occupancy Sensors: One for each type and color specified.

D. Field Quality Control Reports.

E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Operation and Maintenance Data: Include detailed information on device programming and setup.

G. Maintenance Materials: Furnish the following for the County's use in maintenance of project.

H. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.6 QUALITY ASSURANCE

A. Conform to requirements of CEC.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. Provide five year manufacturer warranty for all occupancy sensors.

B. Provide five year manufacturer warranty for utility grade locking receptacle-mounted outdoor photo controls.

C. Provide two year manufacturer warranty for all daylighting controls.

PART 2 PRODUCTS

2.1 FURNISH PRODUCTS AS INDICATED IN THE LIGHITNG OCCUPANCY SENSOR LEGEND AND SCHEDULE ON PLAN.

2.2 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A.

1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.
3. Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

2.3 OCCUPANCY SENSORS

A. All Occupancy Sensors:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
2. Sensor Technology:
   a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
   b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
   c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
   d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.

5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.

6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.

7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.

8. Sensitivity: Field adjustable.

9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.

10. Compatibility (Non-Dimming Sensors): Suitable for controlling LED lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

11. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.

12. Where wired sensors are indicated, wireless sensors are not acceptable without prior approval of Architect.

B. Wall Switch Occupancy Sensors:

1. All Wall Switch Occupancy Sensors:

a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.

b. Unless otherwise indicated or required to control the load indicated on drawings, provide line voltage units with self-contained relay.

c. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).

d. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.

e. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.

f. Provide vandal resistant lenses for passive infrared (PIR) and dual technology wall switch occupancy sensors where indicated.

2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 400 square feet.

4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

C. Wall Dimmer Occupancy Sensors:

1. General Requirements:

a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated 0-10V dimming control capability , and no leakage current to load in off mode.

b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).

c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.

d. Dimmer: 0-10VDC dimming.

e. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.

2. Passive Infrared (PIR) Wall Dimmer Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

D. Ceiling Mounted Occupancy Sensors:

1. All Ceiling Mounted Occupancy Sensors:

a. Description: Low profile occupancy sensors designed for ceiling installation.

b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.

c. Finish: White unless otherwise indicated.

2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

3. Ultrasonic Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within an area of 500 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

b. Medium Range Sensors: Capable of detecting motion within an area of 1,000 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

c. Extended Range Sensors: Capable of detecting motion within an area of 2,000 square feet at a mounting height of 9 feet.

4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet.

E. Directional Occupancy Sensors:

1. All Directional Occupancy Sensors: Designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.

a. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.

2. Passive Infrared (PIR) Directional Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 10 feet.

b. Long Range Sensors: Capable of detecting motion within a distance of 80 feet at a mounting height of 10 feet.

3. Passive Infrared/Ultrasonic Dual Technology Directional Occupancy Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 10 feet.

F. Power Packs for Low Voltage Occupancy Sensors:

1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.

2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.

3. Input Supply Voltage: Dual rated for 120/277 V ac.

4. Load Rating: As required to control the load indicated on drawings.

G. Accessories:

1. Provide heavy duty coated steel wire protective guards compatible with specified occupancy sensors for occupancy sensors located in areas where inmates may be alone. on plans.

H. OUTDOOR PHOTO CONTROLS

1. Stem-Mounted Outdoor Photo Controls:

a. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.

b. Housing: Weatherproof, impact resistant polycarbonate.

c. Photo Sensor: Cadmium sulfide.

d. Provide external sliding shield for field adjustment of light level activation.

e. Light Level Activation: 1 to 5 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.

f. Voltage: As required to control the load indicated on the drawings.

g. Failure Mode: Fails to the on position.

h. Load Rating: As required to control the load indicated on the drawings.

i. Provide accessory wall-mounting bracket where indicated or as required to complete installation.

I. ACCESSORIES

1. Auxiliary Contacts:

a. Comply with NEMA ICS 5.

b. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each lighting contactor, minimum.

2. Pilot Devices:

a. Comply with NEMA ICS 5; heavy-duty type.

b. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.

c. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.

d. Indicating Lights: Push-to-test type unless otherwise indicated.

e. Provide LED lamp source for indicating lights and illuminated devices.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with CEC.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1, except for mounting heights specified in that standard

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of lighting control devices provided under this section.

1. Mounting Heights: Unless otherwise indicated, as follows:

a. Wall Switch Occupancy Sensors: 46 inches above finished floor to top of box CEC 1117B.6(5).

b. In-Wall Time Switches: 46 inches above finished floor to top of box CEC 1117B.6(5).

c. In-Wall Interval Timers: 46 inches above finished floor to top of box CEC 1117B.6(5).

d. Wall Toggle Switches: 46 inches above finished floor to top of box CEC 1117B.6(5).

2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.

3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect and/or District Representative to obtain direction prior to proceeding with work.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 27 26.

G. Provide required supports in accordance with Section 26 05 29.

H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

I. Identify lighting control devices in accordance with Section 26 05 53.

J. Occupancy Sensor Locations:

1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.

2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

K. Outdoor Photo Control Locations:

1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.

2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

L. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

M. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

N. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

O. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

P. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

Q. Where indicated or required, provide cabinet or enclosure in accordance with Section 26 2716 for mounting of lighting control device system components.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

D. Test outdoor photo controls to verify proper operation, including time delays where applicable.

E. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by manufacturer.

C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.

D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

E. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect/Engineer.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

A. See Section 01 79 00 - System Training and Demonstration, for additional requirements.

B. Demonstration: Demonstrate proper operation of lighting control devices to District Representative, and correct deficiencies or make adjustments as directed.

C. Training: Train the County's personnel on operation, adjustment, programming, and maintenance of lighting control devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of two hours of training.

3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.

4. Location: At project site.

END OF SECTION

SECTION 26 21 00 - LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical service requirements.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for cast-in-place concrete equipment pads.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 33.13 - Conduit for Electrical Systems.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 24 13 - SWITCHBOARD - DISTRIBUTION PANEL: Service entrance equipment.

1. Includes utility metering transformer compartment.

G. Section 26 24 16 - Panelboards: Service entrance equipment.

H. Section 26 28 16.16 - Enclosed Switches: Service entrance equipment.

I. Section 26 32 14 - Diesel Generator System with Integrated Paralleling: Emergency/standby power systems for interconnection with normal utility electrical supply.

J. Section 26 36 00 - Transfer Switches: Service entrance equipment.

K. Section 26 43 00 - Surge Protective Devices: Service entrance surge protective devices.

L. Section 31 23 33-Trenching and backfilling: Excavating, bedding and backfilling.

1.3 DEFINITIONS

A. Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in CEC, and as designated by the Utility Company.

1.4 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code 2017.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. California Electrical Code (CEC) - 2022

1.5 ADMINISTRATIVE REQUIREMENTS

A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.

B. Coordination:

1. Verify the following with Utility Company representative:

a. Utility Company requirements, including division of responsibility.

b. Exact location and details of utility point of connection.

c. Utility easement requirements.

d. Utility Company charges associated with providing service.

2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.

3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Coordinate the work with other installers to provide communication lines required for Utility Company meters.

5. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.

D. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.

E. Scheduling:

1. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.6 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Utility Company letter of availability for providing electrical service to project.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, outline and support point dimensions, finishes, weights, service condition requirements, and installed features.

D. Shop Drawings: Include dimensioned plan views and sections indicating locations and arrangement of Utility Company and service entrance equipment, metering provisions, required clearances, and proposed service routing.

1. Obtain Utility company approval of shop drawings prior to submittal.

E. Drawings prepared by Utility Company.

F. Project Record Documents: Record actual locations of equipment and installed service routing.

1.7 QUALITY ASSURANCE

A. Comply with the following:

1. IEEE C2 (National Electrical Safety Code).

2. CEC (California Electrical Code).

3. The requirements of the Utility Company.

4. The requirements of the local authorities having jurisdiction.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 ELECTRICAL SERVICE REQUIREMENTS

A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.

B. Electrical Service Characteristics: As indicated on drawings.

C. Utility Company: As indicated on drawings.

D. Division of Responsibility: Per Utility Company requirements.

E. Products Furnished by : Comply with Utility Company requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Verify and mark locations of existing underground utilities.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions and Utility Company requirements.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required trenching and backfilling in accordance with Section 31 23 33.

E. Construct cast-in-place concrete pads for utility equipment in accordance with Utility Company requirements and Section 03 30 00.

F. Provide required protective bollards in accordance with Utility Company requirements.

G. Provide required support and attachment components in accordance with Section 26 05 29.

H. Provide grounding and bonding for service entrance equipment in accordance with Section 26 05 26.

I. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 26 05 53.

3.4 PROTECTION

A. Protect installed equipment from subsequent construction operations.

END OF SECTION

SECTION 26 22 00 - LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General purpose transformers.

B. Buck-boost transformers.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 33.13 - Conduit for Electrical Systems: Flexible conduit connections.

E. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

1. Includes requirements for the seismic qualification of equipment specified in this section.

F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers Current Edition.

B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers 2015.

C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers 2013.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers 2015.

F. NEMA ST 20 - Dry-Type Transformers for General Applications 2014.

G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.

I. California Electrical Code (CEC) - 2022

J. UL 506 - Standard for Specialty Transformers Current Edition, Including All Revisions.

K. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by CEC.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate the work with placement of supports, anchors, etc. required for mounting.

4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.

1. Vibration Isolators: Include attachment method and rated load and deflection.

2. Buck-boost Transformers: Include voltage selection tables and wiring diagrams for autotransformer configurations.

C. Manufacturer's equipment seismic qualification certification.

D. Project Record Documents: Record actual locations of transformers.

1.6 QUALITY ASSURANCE

A. Comply with requirements of CEC.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Ambient Temperature: Do not exceed the following maximum temperatures during and after installation of transformers.

1. Greater than 10 kVA: 104 degrees F maximum.

2. Less than 10 kVA: 77 degrees F maximum.

1.9 WARRANTY

A. All transfomers and components shall have a minimum 2 year warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Corporation: www.eaton.com/#sle.

B. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

C. Siemens Industry, Inc: www.usa.siemens.com/#sle.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 TRANSFORMERS - GENERAL REQUIREMENTS

A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.

B. Seismic Qualification: Provide transformers suitable for application under seismic design criteria in accordance with Section 26 05 48 where required. Include certification of compliance with submittals.

C. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:

1. Altitude: Less than 3,300 feet.

2. Ambient Temperature:

   a. Greater than 10 kVA: Not exceeding 104 degrees F.

   b. Less than 10 kVA: Not exceeding 77 degrees F.

D. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

E. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.

F. Basic Impulse Level: 10 kV.

G. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

H. Isolate core and coil from enclosure using vibration-absorbing mounts.

I. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.3 GENERAL PURPOSE TRANSFORMERS

A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.

B. Insulation System and Allowable Average Winding Temperature Rise:

1. Less than 15 kVA: Class 180 degrees C insulation system with 80 degrees C average winding temperature rise.

2. 15 kVA and Larger: Class 220 degrees C insulation system with 115 degrees C average winding temperature rise.

C. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.

D. Winding Taps:

1. Less than 3 kVA: None.

2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.

3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.

4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.

E. Energy Efficiency: Comply with 10 CFR 431, Subpart K.

F. Sound Levels: Low sound levels with maximum sound levels as follows:

1. 0-9 kVA: 40 dB.
2. 10-50 kVA: 45 dB.
3. 51-150 kVA: 50 dB.
4. 151-300 kVA: 55 dB.
5. 301-500 kVA: 60 dB.
6. 501-700 kVA: 62 dB.
7. 701-1000 kVA: 64 dB.

G. Mounting Provisions:

1. Less than 15 kVA: Suitable for wall mounting or trapeze.
2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
3. Larger than 75 kVA: Suitable for floor mounting.

H. Transformer Enclosure: Comply with NEMA ST 20.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor clean, dry locations: Type 1.
   b. Outdoor locations: Type 3R.
2. Provide lifting eyes or brackets.
3. Enclosures coverplates shall be code gauge sheet steel, captive bolted to the enclosure framework. Enclosure shall have suitable ventilating openings with rodent-proof screens. Transformer shall be furnished complete with mounting channels and mounting bolts. Enclosures shall be provided with lifting lugs and jacking plates as required. Metal parts excepting cores and core mounting frames shall be cleaned, rust-proofed, and be given a heavy coating of an inert primer. Coverplates and external metal parts shall be finished with two full-bodies coatings of oil-resistant industrial gray enamel.
4. Isolate core and coil from enclosure using vibration-absorbing mounts.

5. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.

I. Accessories:

1. Mounting Brackets: Provide manufacturer's standard brackets.

2. Weathershield Kits: Provide for ventilated transformers installed outdoors to provide a listed NEMA 250, type 3R assembly.

3. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.

2.4 BUCK-BOOST TRANSFORMERS

A. Description: Self-cooled, four winding, buck-boost transformers listed and labeled as complying with UL 506 or UL 1561, and suitable for field connection as an autotransformer; ratings as indicated on the drawings.

B. Insulation System and Allowable Average Winding Temperature Rise:

1. Less than 0.25 kVA: Class 105 degree C insulation system with 55 degrees C rise.

2. 0.25 kVA and Larger: Class 180 degree C insulation system with 80 degree C rise.

C. Coil Conductors: Continuous windings.

D. Lugs: Suitable for terminating conductors sized for full rated load ampacity of transformer when operating in buck-boost configuration indicated.

E. Mounting Provisions: Suitable for wall mounting.

F. Transformer Enclosure: Comply with NEMA ST 20.

1. Environment Type per NEMA 250: As indicated on the drawings.

2. Construction: Steel, totally enclosed, non-ventilated.

3. Finish: Manufacturer's standard grey, suitable for outdoor installations.

G. Isolate core and coil from enclosure using vibration-absorbing mounts.

H. Nameplate: Include transformer connection data.

2.5 SOURCE QUALITY CONTROL

A. Factory test transformers according to NEMA ST 20.

B. Sound Level Tests: Perform factory test designated in NEMA ST 20 as "design" test on each production unit.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.

C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install transformers in accordance with NECA 409 and IEEE C57.94.

D. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and CEC.

E. Install transformers plumb and level.

F. Transformer Support:

1. Provide required support and attachment in accordance with Section 26 05 29, where not furnished by transformer manufacturer.

2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.

3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.

4. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

G. Provide grounding and bonding in accordance with Section 26 05 26.

H. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.

I. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.

J. Where furnished as a separate accessory, install transformer weathershield per manufacturer's instructions.

K. Identify transformers in accordance with Section 26 05 53.

L. Set transformer plumb and level. Installation shall be in accordance with manufacturer’s instructions.

M. Use flexible conduit, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure. Flexible jumpers shall be installed for grounding continuity from enclosures to conduits or bus ducts.

N. Mount transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure. Mounting bolts on floor mounted transformers shall extend into pads only and shall not be in direct contact with building structural members.

O. Transformer conduit windows shall be filled with crushed rock and sealed with one inch of lightweight grout after all conduits are installed.

P. When installed outdoors, pad mounted transformer shall be installed to maintain sixteen-foot clearance from the lowest point of building roofs to the top of transformer enclosure, and other obstructions to avoid use as a step to building roofs. Maintain minimum of eight-foot clearance in front of transformer.

Q. Primary electrical equipment shall be anchored to concrete base in accordance with seismic zone 4 design requirements; Section 26 05 48.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS Sections 7.2.1.1 and 7.2.1.2. Tests and inspections listed as optional are not required.

3.4 ADJUSTING

A. Measure primary and secondary voltages and make appropriate tap adjustments.

B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A. Clean dirt and debris from transformer components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 24 13 - SWITCHBOARD - DISTRIBUTION PANEL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Switchboards and Distribution Panel.

B. Overcurrent protective devices for switchboards.

C. Switchboard and Distribution Panel accessories.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

1. Includes requirements for the seismic qualification of equipment specified in this section.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

G. Section 26 21 00 - Low-Voltage Electrical Service Entrance.

H. Section 26 43 00 - Surge Protective Devices.

I. Section 26 08 13 - Acceptance Testing.

1.3 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e (Amended 2017).

B. ANSI C39.1 - American National Standard Requirements for Electrical Analog Indicating Instruments; 1981 (R1992).

C. IEEE C12.1 - American National Standard Code for Electricity Metering; Institute of Electrical and Electronic Engineers; 1988.

D. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers 2016.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

F. NECA 400 - Standard for Installing and Maintaining Switchboards 2007.

G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

H. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum) 2013.

I. NEMA PB 2 - Deadfront Distribution Switchboards 2011.

J. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less 2013.

K. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.

L. California Electrical Code (CEC) - 2022

M. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.

N. UL 869A - Reference Standard for Service Equipment Current Edition, Including All Revisions.

O. UL 891 - Switchboards Current Edition, Including All Revisions.

P. UL 1053 - Ground-Fault Sensing and Relaying Equipment Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by CEC.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.

5. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Service Entrance Switchboards:

1. Coordinate with Utility Company to provide switchboards with suitable provisions for electrical service and utility metering, where applicable.
2. Coordinate with the County to arrange for Utility Company required access to equipment for installation and maintenance.
3. Obtain Utility Company approval of switchboard prior to fabrication.
4. Preinstallation Meeting: Convene one week prior to commencing work of this section to review requirements with Utility Company representative.
5. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.
   1. Provide electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time current curves of all equipment and components.

C. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of switchboards and adjacent equipment with all required clearances indicated.
   2. Include wiring diagrams showing all factory and field connections.
   3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
   4. Include documentation of listed series ratings.
   5. Include documentation demonstrating selective coordination.
   6. Identify mounting conditions required for equipment seismic qualification.

D. Manufacturer's equipment seismic qualification certification.

E. Service Entrance Switchboards: Include documentation of Utility Company approval of switchboard.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Project Record Documents: Record actual installed locations of switchboards and final equipment settings.

1.6 QUALITY ASSURANCE

A. Conform to requirements of CEC.

B. Manufacturer: Company specializing in manufacturing or assembling Products specified in this Section with minimum three years documented experience. Companies assembling components manufactured by others must meet the requirements of Paragraph 2.2A.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

D. Qualification Statements

1. Manufacturer’s Qualifications

a. Provide documentation to show compliance with qualification requirements.

E. Closeout Submittals

F. Operation and Maintenance Data

1. Submit under provisions of Division 1.

2. Maintenance Data

a. Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals; and Owner operation instructions.

G. Regulatory Requirements

1. Conform to requirements of CEC.

2. Furnish products listed and classified by Underwriters Laboratories, Inc. or a testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.

B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.

C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

1.9 MAINTENANCE

A. Extra Materials

1. Provide six of each size and type of fuse installed. Package fuses and mark package with building name, number and switchboard designation.

B. Maintenance Service

1. Provide six of each type key.

2. Provide two fuse pullers.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Switchboards - Basis of Design: Eaton Corporation.

B. Switchboards- Other Acceptable Manufacturers:

1. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

2. Siemens Industry, Inc: www.usa.siemens.com/#sle.

C. Substitutions: See Section 01 60 00 - Product Requirements.

D. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

E. Source Limitations: Furnish switchboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 MANUFACTURED UNITS

A. Switchboards constructed by local assemblers will not be approved except that switchboards constructed by assemblers utilizing the same manufacturing and quality standards as the manufacturer of the protection devices may be approved.

2.3 DISTRIBUTION PANEL

A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.

D. Service Entrance Switchboards:

1. Listed and labeled as suitable for use as service equipment according to UL 869A.

2. For solidly-grounded wye systems, provide factory-installed main bonding jumper between neutral and ground busses, and removable neutral disconnecting link for testing purposes.

3. Comply with Utility Company requirements for electrical service.

4. Utility Metering Provisions: Provide separate barriered compartment complying with Utility Company requirements where indicated or where required by Utility Company. Include hinged sealable door and provisions for Utility Company current transformers (CTs), potential transformers (PTs), or potential taps as required.

5. See Section 26 21 00 for additional requirements.

E. Seismic Qualification: Provide switchboards and associated components suitable for application under the seismic design criteria specified in Section 26 05 48 where required. Include certification of compliance with submittals.

F. Service Conditions:

1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:

a. Altitude: Less than 6,600 feet.

b. Ambient Temperature:

1) Switchboards Containing Molded Case or Insulated Case Circuit Breakers: Between 23 degrees F and 104 degrees F.

2) Switchboards Containing Fusible Switches: Between -22 degrees F and 104 degrees F.

2. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

G. Short Circuit Current Rating:

1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.

2. Minimum Rating: 65,000 rms symmetrical amperes.

3. Listed series ratings are not acceptable.

H. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

I. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.

J. Bussing: Sized in accordance with UL 891 temperature rise requirements.

1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.

2. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.

3. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

4. Phase and Neutral Bus Material: Copper.

5. Ground Bus Material: Copper.

6. Make main horizontal buses and connections between main bus and switching device of sufficient size to limit temperature rise to 65 degrees C over average room air.

7. Provide main horizontal bus of rating indicated, full-size continuous with provision for future extension.

8. Neutral bus: Full-size, continuous with provision for future extension.

9. Tin plate each main bus and tap connection over full surface of joints.
10. Current density of all buses shall not exceed 1,000 amperes per square inch for copper.
11. Tightly fasten main bus connections to ensure maximum conductivity. Bolted connections are to be tightened with a torque wrench to manufacturers recommended torques.
12. Properly brace feeder circuit bussing.
13. Provide continuous 1/4 inch x 2 inches copper ground bus for switchboard. Solidly ground to each structure near bottom. In service section provide ground-to-neutral bus disconnecting link on service entrance equipment.

K. Conductor Terminations: Suitable for use with the conductors to be installed.

1. Line Conductor Terminations:
    a. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
    b. Main and Neutral Lug Type: Mechanical.
2. Load Conductor Terminations:
    a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
    b. Lug Type:
        1) Provide mechanical lugs.

L. Enclosures:

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    a. Indoor Clean, Dry Locations: Type 1 or Type 2 (drip-proof).
    b. Outdoor Locations: Type 3R.
2. Finish: Manufacturer's standard unless otherwise indicated.
3. Outdoor Enclosures:
    a. Enclosure Type: Non-walk-in type unless otherwise indicated.
    b. Color: Manufacturer's standard.
    c. Access Doors: Lockable, with all locks keyed alike.

M. Neatly lace all control wiring and leave flexibility at hinge locations.

N. Bus Connections: Bolted, accessible from front for maintenance.

O. Line and Load Terminations: Accessible from the front of the switchboard only, suitable for the conductor materials and sizes indicated.

P. Where indicated provide metering transformer compartment for County use. Provide compartment size, bus spacing and drilling, door, and locking and sealing requirements as required.

Q. Align sections at front only.

R. Switchboard Height: 90 inches, excluding floor sills, lifting members and pull boxes.

S. Finish: Manufacturer’s standard light gray enamel on external surfaces. Coat internal surfaces with minimum one coat corrosion?resisting paint, or plate with cadmium or zinc.

T. Completely enclosed self-supporting metal structure of the required number of formed and welded vertical panel sections, incorporating circuit protective devices and other associated equipment as indicated.

U. Bolt all fastenings between vertical sections.

V. Completely enclose switchboard on front, sides, top and rear with removable sheet steel plates minimum 12 gauge.

W. Provide bolted frame rear to support and house cables and other items.

X. Provide bolted frames and insulating blocks to support and brace main, normal and emergency buses for short circuit stresses up to 65,000 amperes minimum or as determined by the short circuit study.

Y. Do not use cabling inside switchboard as substitute for bus bar conductors, unless otherwise indicated.

Z. Provide each circuit with nameplate in accordance with Section 26 05 53 letters to designate purpose of circuit.

AA. Future Provisions:

1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2. Equip distribution sections with full height vertical bussing to accommodate maximum utilization of space for devices.

3. Where designated spaces for future device provisions are not indicated, include provisions for minimum of 4 device(s) rated at 225 amperes.

4. Arrange and equip through bus and ground bus to accommodate future installation of additional switchboard sections.

BB. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

1. Where overcurrent protective devices equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.

2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.

a. Use zero sequence ground fault detection method unless otherwise indicated.

b. Provide test panel and field-adjustable ground fault pick-up and delay settings.

CC. Arc Flash Energy-Reducing Maintenance Switching: For circuit breakers rated 1200 A or higher, provide a local accessory switch with status indicator light that permits selection of a maintenance mode with alternate electronic trip unit settings for reduced fault clearing time.

DD. Description: NEMA PB 2 switchboard with electrical ratings and configurations as indicated on plans.

2.4 OVERCURRENT PROTECTIVE DEVICES

A. Circuit Breakers:

1. Interrupting Capacity:

a. Switchboards and circuit breakers shall be rated for fault current values based on the results of the short circuit studies.

b. Provide fully rated systems. Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

c. Series Rated Systems are not acceptable.

2. Molded Case Circuit Breakers:

a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

b. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

c. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.

1) Provide the following field-adjustable trip response settings:

a) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.

b) Long time delay.

c) Short time pickup and delay.

d) Instantaneous pickup.

e) Ground fault pickup and delay where ground fault protection is indicated.

d. Provide the following features and accessories where indicated or where required to complete installation:

1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

2) Pad-Lock Provision: For locking circuit breaker handle in OFF position.

2.5 ELECTRICAL METERING AND VOLTAGE PROTECTION SYSTEM

A. IEEE C37.90 or IEC 61000-4-X.

B. Power meters shall be multi-function 3 phase, 4 wire solid-state units as follows:

1. Meter function shall include the following as a minimum with a minimum of 2 percent accuracy:

a. Amperes per phase, three phases.

b. Volts: Phase-to-phase and phase-to-neutral.

c. Watthours.

d. Watt or Ampere demand.

e. Watt or Ampere peak demand with reset button.

2. Digital readout display on face of unit.

3. Units shall be capable of direct connection to 480/277 or 208/120-volt systems without the use of separate potential transformers. Meters may use a voltage/power module, manufactured specifically for this use, to accomplish direct connection of meters to 480/277-volt circuits. Where unit does not provide internal protection, a 3 pole branch

circuit breaker or fuses, sized per manufacturer's recommendations, to protect the voltage sensing conductors.

4. Meters shall be capable of utilizing the voltage sensing circuit for unit control power without the need for a separate control power circuit.

5. Meter units shall be data bus ready for future remote monitoring and control.

6. Meter units shall be able to inferface with EMS via BACnet MS/TP protocol.

7. Meter set points and peak demand values shall be non-volatile under power loss conditions.

C. Current Transformers.

1. Current transformers shall be matched to the power meter and shall be rated for the system voltage, amperage, and required burden capacities. Current transformers shall be single ratio, insulation class 600 volts, 60 hertz, and shall have standard accuracy class as listed in Table 5 of IEEE C37.20.1.

2. Current transformers shall be rigidly mounted in the service switchboard ahead of the main bus/breaker connection or in meter transformer cabinet or Guard Tower services. Shorting/test terminal blocks shall be provided for all CT leads if recommended by manufacturer.

D. Meters shall be mounted indoor or outdoor as indicated.

1. Indoor meter enclosures shall be NEMA 1, surface wall mount type with hinged front access panel to accept flush mounting of meter.

2. Outdoor meter enclosures shall be NEMA 4X (non-metallic) wall mount type with hinged clear Lexan cover and padlock clasp. Enclosure shall be provided with a strip heater, if recommended by manufacturer (fed from voltage sensing circuit). Environmental conditions are: 0 to 100 degrees F., and 20 to 100 percent relative humidity.

E. Power Meter Manufacturers:

1. Leviton VerifEye Series 4100.

2. Allen Bradley Bulletin 1400 Power Monitor.

3. Siemens 4700 Power Meter.

4. Square D Powerlogic Circuit Monitor.

5. Power Measurement Ltd. 3720 digital power meter.

F. Include provisions for padlocking and sealing.

2.6 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Factory test switchboards according to NEMA PB 2, including the following production (routine) tests on each switchboard assembly or component:

1. Dielectric tests.

2. Mechanical operation tests.

3. Grounding of instrument transformer cases test.

4. Electrical operation and control wiring tests, including polarity and sequence tests.

5. Ground-fault sensing equipment test.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive switchboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide concrete housekeeping pad under the provisions of Section 03 30 00 where indicated.

B. Install grounding electrode conductor and grounding electrode in accordance with CEC and Section 26 05 26.

C. Obtain approval from site work/utilities contractor to proceed with building service installation.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.

C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.

D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch between switchboard and wall.

E. Provide required support and attachment in accordance with Section 26 05 29.

F. Provide required seismic controls in accordance with Section 26 05 48.

G. Install switchboards plumb and level.

H. Unless otherwise indicated, mount switchboards on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.

I. Provide grounding and bonding in accordance with Section 26 05 26.

J. Install all field-installed devices, components, and accessories.

K. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

L. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 26 05 73.

M. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

N. Provide filler plates to cover unused spaces in switchboards.

O. Identify switchboards in accordance with Section 26 05 53.

P. Brace/Secure in accordance with Section 26 05 48.

Q. Install service entrance conduits from the building service entrance equipment to site work/utility/contractors conduit. Install in accordance with Section 26 05 35. Make final connections between conduits.

R. Install service conductors in accordance with Section 26 05 19.

S. Connect the service conductors at the source end.

T. Connect the service conductors at the load end.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

C. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.

D. Inspect and test in accordance with NETA ATS, except Section 4.

E. Perform inspections and tests listed in NETA ATS, Section 7.1.

F. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

G. Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 100 amperes. Tests listed as optional are not required.

H. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by CEC.

1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.

I. Meters: Perform inspections and tests listed in NETA ATS, Section 7.11.2.

J. Test shunt trips to verify proper operation.

K. Correct deficiencies and replace damaged or defective switchboards or associated components.

L. Site Tests

1. Test under provisions of Section 26 08 13.

2. Check tightness of accessible bolted bus joints using calibrated torque wrench.

3. Manually operate all breakers.

4. Verify operation of all switches, indicators and meters.

5. Measure insulation resistance of each bus section phase to phase and phase to ground for one minute each, at test voltage of 1,000 volts; minimum acceptable value for insulation resistance is 2 megohms.

6. Physically test key interlock systems to ensure proper function.

3.5 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of switchboard covers and doors.

C. Adjust work under provisions of Section 26 08 13.

D. Adjust all operating mechanisms for free mechanical movement.

E. Tighten bolted bus connections in accordance with manufacturer’s instructions.

F. Connect to kilowatt hour metering system in accordance with Section 33 71 73.

G. Adjust circuit breaker trip and time delay settings to values as instructed by the County Representative.

3.6 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.

C. Repair scratched or marred surfaces to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

A. See Section 01 79 00 - System Training and Demonstration, for additional requirements.

B. Training: Train the County's personnel on operation, adjustment, and maintenance of switchboard and associated devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of two hours of training.

3. Instructor: Manufacturer's authorized representative.

4. Location: At project site.

3.8 PROTECTION

A. Protect installed switchboards from subsequent construction operations.

END OF SECTION

SECTION 26 24 16 - PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

1. Includes requirements for the seismic qualification of equipment specified in this section.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

G. Section 26 08 13 - Acceptance Testing.

H. Section 26 43 00 - Surge Protective Devices.

1.3 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e (Amended 2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts 2000, with Errata (2008).

F. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum) 2013.

G. NEMA PB 1 - Panelboards 2011.

H. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less 2013.

I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.

J. California Electrical Code (CEC) - 2022

K. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.

L. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.

M. UL 67 - Panelboards Current Edition, Including All Revisions.

N. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.

O. UL 943 - Ground-Fault Circuit-Interrupters Current Edition, Including All Revisions.

P. UL 1053 - Ground-Fault Sensing and Relaying Equipment Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by CEC.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.

4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Identify panels by alphanumeric designation with branch circuit breaker sizes and types indicated in panel schedule or one-line-diagram.

2. Identify mounting conditions required for equipment seismic qualification.

D. Manufacturer's equipment seismic qualification certification.

E. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

G. Maintenance Materials: Furnish the following for the County's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Panelboard Keys: Six of each different key.

H. Closeout Submittals

1. Operating and Maintenance Data

a. Provide operating and maintenance instructions.

1.6 QUALITY ASSURANCE

A. Conform to requirements of CEC.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:

1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Corporation; - www.eaton.com/#sle.

B. Schneider Electric; Square D Products: Square D is the basis of design; manufacturer is existing on campus.

C. Siemens Industry, Inc: www.usa.siemens.com/#sle.

D. Substitutions: See Section 01 60 00 - Product Requirements.

E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Seismic Qualification: Provide panelboards and associated components suitable for application under the seismic design criteria specified in Section 26 05 48 where required. Include certification of compliance with submittals.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature:

a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

D. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.

2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

3. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Outdoor Locations: Type 3R.

2. Boxes: Galvanized steel unless otherwise indicated.

a. Provide wiring gutters sized to accommodate the conductors to be installed.

b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.

c. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.

3. Fronts:

a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.

b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.

c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.

4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

1. Provisions for future breakers shall be at the bottom of the panel.

K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list and label panelboards as a complete assembly including surge protective device.

L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.

2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.

a. Use zero sequence ground fault detection method unless otherwise indicated.

b. Provide test panel and field-adjustable ground fault pick-up and delay settings.

M. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

N. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

O. Provide the following features and accessories where indicated or where required to complete installation:

1. Feed-through lugs.

2. Sub-feed lugs.

P. Special Features

1. Provide blocking clips on circuit breakers as required or shown.

2. Provide barriered space for mounting contactors and control devices with a hinged door and lock, where shown or required.

3. Provide neutral bars with terminal for all active, spare, and inactive circuits.

4. Provide feed-thru lugs or sub-feed lugs for 2 and 3 section panels.

5. Equip bus bars for panelboard with main lugs, main fused switch or main circuit breaker, capacity as required or indicated.

6. Provide special features such as split bus, lighting contactors, extra-width gutters as required.

7. Provide panels with individual branch circuit power metering where noted on plans for connections to Facility energy management system. Provide square D type NFMVP, NQMVP or approved equal.

2.3 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase and Neutral Bus Material: Copper.

2. Ground Bus Material: Copper.

D. Circuit Breakers:

1. Provide bolt-on type.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures unless otherwise indicated.

2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

3. Provide clear plastic circuit directory holder mounted on inside of door.

F. Description: NEMA PB 1, circuit breaker type.

G. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.

H. Molded Case Circuit Breakers: With integral thermal and instantaneous magnetic trip in each pole; UL listed. For air conditioning equipment branch circuits provide circuit breakers UL listed as Type HACR.

I. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.

J. Enclosure: NEMA PB 1, Type 1, 6 inches deep, 20 inches wide, cabinet box.

K. Cabinet Front: Surface type, fastened with screws, hinged door with flush lock, metal directory frame, finished in manufacturer's standard gray enamel.

2.4 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.

2. Phase and Neutral Bus Material: Copper.

3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.

2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

3. Provide clear plastic circuit directory holder mounted on inside of door.

F. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

G. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard ; provide insulated ground bus where scheduled.

H. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type, with common trip handle for all poles; UL listed.

1. Type SWD for lighting circuits.

2. Type HACR for air conditioning equipment circuits.

3. Class A ground fault interrupter circuit breakers where scheduled.

4. Do not use tandem circuit breakers.

I. Cabinet Box: 6 inches deep, 20 inches wide for 240 volt and less panelboards, 20 inches wide for 480 volt panelboards.

J. Cabinet Front: Flush cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

2. Interrupting Capacity:

a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:

1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.

2) 14,000 rms symmetrical amperes at 480 VAC.

b. Provide fully rated systems. Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated

c. Series Rated Systems are not acceptable.

3. Conductor Terminations:

a. Provide mechanical lugs.

b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.

a. Provide the following field-adjustable trip response settings:

1) Long time pickup, adjustable by setting dial.

2) Long time delay.

3) Short time pickup and delay.

4) Instantaneous pickup.

5) Ground fault pickup and delay where ground fault protection is indicated.

6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

7. Provide the following circuit breaker types where indicated:

   a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.

8. Do not use tandem circuit breakers.

9. Do not use handle ties in lieu of multi-pole circuit breakers.

10. Provide multi-pole circuit breakers or circuit breaker handle-ties for multi-wire branch circuits as required by CEC.

11. Provide the following features and accessories where indicated or where required to complete installation:

    a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

    b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

2.6 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and CEC.

E. Provide required support and attachment in accordance with Section 26 05 29.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

I. Mount floor-mounted power distribution panelboards on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.

J. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

K. Provide grounding and bonding in accordance with Section 26 05 26.

1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.

2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.

L. Install all field-installed branch devices, components, and accessories.

M. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

N. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by CEC.

O. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 05 73.

P. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

Q. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.

R. Install panelboards plumb. Install recessed panelboards flush with wall finishes.

S. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.

T. Provide filler plates to cover unused spaces in panelboards.

U. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:

1. Emergency and night lighting circuits.

2. Fire detection and alarm circuits.

3. Intrusion detection and access control system circuits.

4. Video surveillance system circuits.

V. Identify panelboards in accordance with Section 26 05 53.

W. Provide computer-generated circuit directory for each lighting and appliance panelboard and each power distribution panelboard provided with a door, clearly and specifically indicating the loads served. Identify spares and spaces.

X. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

Y. Provide engraved plastic nameplates under the provisions of Section 26 0553.

Z. Provide white-filled letters on red phenolic nameplates for all panels connected to generator and/or UPS power.

AA. Provide arc flash warning labels in accordance with CEC.

BB. Ground and bond panelboard enclosure according to Section 26 0526.

3.3 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 4000.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

D. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 100 amperes. Tests listed as optional are not required.

E. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by CEC.

F. Test under provisions of Section 26 08 13.

G. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi?wire branch circuits.

H. Test GFCI circuit breakers to verify proper operation.

I. Test shunt trips to verify proper operation.

J. Correct deficiencies and replace damaged or defective panelboards or associated components.

K. Perform inspections and tests listed in NETA STD ATS, Section 7.5 for switches, Section 7.6 for circuit breakers.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.5 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 27 13 - ELECTRICITY METERING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Equipment for the County electricity metering:

1. Single circuit electricity meters.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 33.16 - Boxes for Electrical Systems: Cabinets and enclosures for metering system components.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 21 00 - Low-Voltage Electrical Service Entrance: Requirements for Utility Company electricity metering.

F. Section 26 28 13 - Fuses.

1. Includes requirements for spare fuses and spare fuse cabinets.

1.3 REFERENCE STANDARDS

A. ANSI C12.1 - Electric Meters - Code for Electricity Metering 2016.

B. ANSI C12.20 - American National Standard for Electricity Meters - 0.2 and 0.5 Accuracy Classes 2015.

C. IEC 62053-21 - Electricity Metering Equipment (A.C.) - Particular Requirements - Part 21: Static Meters for Active Energy (Classes 1 and 2) 2020.

D. IEC 62053-22 - Electricity Metering Equipment (A.C.) - Particular Requirements - Part 22: Static Meters for Active Energy (Classes 0,2 S and 0,5 S) 2020.

E. IEC 62053-23 - Electricity Metering Equipment (A.C.) - Particular Requirements - Part 23: Static Meters for Reactive Energy (Classes 2 and 3) 2020.

F. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers 2016.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

H. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.

J. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. California Electrical Code (CEC) - 2022

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate work to provide equipment suitable for interface with electricity metering systems to be provided.

2. Coordinate the work with other installers to provide communication lines required for electricity metering system interface.

3. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Conduct meeting with facility representative and other related equipment manufacturers to discuss electricity metering system interface requirements.

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for electricity metering systems and associated components and accessories. Include ratings, configurations, standard wiring diagrams, dimensions, service condition requirements, and installed features.

B. Shop Drawings: Include system interconnection schematic diagrams showing all factory and field connections. Include requirements for interface with other systems.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Field Quality Control Test Reports.

E. Project Record Documents: Record actual installed locations of meters and final equipment settings.

F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

G. Maintenance Materials: Furnish the following for the County's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Enclosure Keys: Two of each different key.
3. See Section 26 28 13 for requirements for spare fuses and spare fuse cabinets.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Comply with requirements of CEC.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Electricity Meters - Basis of Design: Leviton Series 4100.

B. Electricity Meters- Other Acceptable Manufacturers:

1. Same as manufacturer of electrical distribution equipment used for this project.
    a. Eaton Corporation: www.eaton.com/#sle.
    b. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
    c. Siemens Industry, Inc: www.usa.siemens.com/#sle.

C. Substitutions: See Section 01 60 00 - Product Requirements.

D. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

E. Source Limitations: Furnish electricity meters produced by a single manufacturer and obtained from a single supplier.

2.2 EQUIPMENT FOR OWNER ELECTRICITY METERING

A. Provide microprocessor-based digital electricity metering systems including all instrument transformers, wiring, and connections necessary for measurements specified.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide electricity metering systems and associated components compatible with the equipment and associated circuits to be metered.

D. Service Conditions: Provide electricity meters suitable for operation under the service conditions at the installed location.

E. Enclosures:

1. Where not furnished by manufacturer, provide required cabinets and enclosures in accordance with Section 26 05 33.16.

2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Outdoor Locations: Type 3R or Type 4.

3. Provide lockable door(s) for outdoor locations.

4. Finish: Manufacturer's standard unless otherwise indicated.

F. Instrument Transformers:

1. Comply with IEEE C57.13, where applicable.

2. Select suitable ratio, burden, and accuracy as required for connected devices.

3. Current Transformers: Compatible with connected meters; replace meters damaged by connection of incompatible current transformers. Provide shorting terminal blocks for connection of secondaries where applicable.

4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

G. Interface with Other Work:

1. Interface with energy management system (EMS).

2.3 SINGLE CIRCUIT ELECTRICITY METERS

A. Single Circuit Electricity Meter:

1. Basis of Design: Leviton VerifEye Series 4100 Bidirectional Meter.
2. Accuracy:
3. Measured Parameters:
    a. Voltage (Volts AC); line-to-line and line-to-neutral; per phase.
    b. Current (Amps); per phase.
    c. Frequency (Hz).
    d. Real/active power (kW); per phase and total of all phases.
    e. Reactive power (kVAR); per phase and total of all phases.
    f. Apparent power (kVA); per phase and total of all phases.
    g. Power factor; per phase and total of all phases.
    h. Real/active energy (kWh).
    i. Reactive energy (kVARh).
    j. Apparent energy (kVAh).
    k. Power demand; real/active, reactive, and apparent; present and maximum.
    l. Current demand.
    m. Bi-directional energy measurements; real/active and reactive; imported and exported.
4. Communications: Compatible with connected systems. Provide all accessories necessary for proper interface.
    a. Serial Communications: RS-485; support for Modbus RTU protocol.
    b. Ethernet Communications: Support for BACnet MS/TP protocol.

B. Provide meter with Leviton Rogowski coil current transformers.

C. Provide single point metering devices capable of metering 1PH/2W, 2PH/3W, 3PH/3W, and/or 3PH/4W loads.

D. Meters must be capable of directly metering North American 120/208/240v,277/480V and 347/600V.

E. Metering units must be capable of metering loads between 50A and 5000A. Provide meters specific to each project as indicated on construction drawings.

F. Must meet all ISO 9001 standards for quality control where all meters test to a minimum of +/- 0.2% or 0.5% accuracy, dependent on stated accuracy class.

G. The system shall be as described below:

1. To consist of electronic meters with embedded communications capability, and solid core, split- core or Rogowski coil current transformer technology. The current transformers shall have a full scale output of 0.1A or .333v and secondary voltage clamps for safety purposes.

2. Meters to be used for Energy Monitoring and Tenant Billing applications

3. The meters will be capable of remote communication from each metering device.

H. Backup power provided by on-board battery maintains the real time clock through power loss (Advanced Meters Only). Energy data is stored in non-volatile memory to maintain value through power loss. Device is capable of holding 65 days of historical data in default settings (Advanced Meters Only)

I. Failure of the building electrical normal power system shall not result in loss of data and will not require manual restarting of the metering system

J. The electronic energy monitoring system shall be fully automated microprocessor-based electrical energy measurement system for Measurement and Verification and Tenant Billing purposes. The system shall incorporate complete metering, communications, reporting functions; energy monitoring and threshold limit capabilities.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of metering systems and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive meters.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Provide required support and attachment components in accordance with Section 26 05 29.

D. Provide grounding and bonding in accordance with Section 26 05 26.

E. Provide fuses complying with Section 26 28 13 as required.

F. Identify meters and associated wiring in accordance with Section 26 05 53.

G. All wiring must meet and or exceed local electrical code.

H. Metering points show on submitted drawings only to be connected or installed

I. Install all wiring in conduit.

J. Provide a non-dedicated or Ethernet drop for remote meter reading and diagnostics of the system

K. Perform all necessary system calibration, testing, commissioning, and demonstrations as required

L. Prepare and submit record drawings and installation, operation and maintenance manuals for the energy management system as required.

3.3 TESTING AND COMMIISSIONING

A. Perform final testing, adjustment, and commissioning of the systems, report results to the Consultant, and include the results in the installation, operation, and maintenance manuals. Provide qualified technicians for testing and commissioning.

B. Perform sufficient technical and operational tests to ensure the technical performance of the system meets the intent of the Contract Documents. Typical testing to include but not be limited to:

1. Verification of meter readings and proper installation of meter equipment

2. Communication system connectivity

3. Meter communication with all software platforms

C. Provide optional functional testing including end to end verification that all meters are operating properly.

D. Demonstrate the operation of the system to the Owner at a time suitable to them. Such demonstration to include product training on how to program the monitoring system.

3.4 FIELD VERIFICATION, ACCEPTANCE, AND TRAINING

A. Provide all “AS BUILT” DRAWINGS and data showing each meter, serial number, address, cross reference, load and CT ratio prior to field verification.

B. Manufacturer’s representative shall verify, adjust and test the system. Verification of the energy monitoring system is to be carried out with the assistance of an electrical contractor at all times. Upon completion, the manufacturer shall issue a “Commissioning Report” to the owner, electrical consultant, contractor and client.

C. Manufacturer’s representative shall demonstrate operation of the system as follows:

1. Local and remote meter readings
2. Phase diagnostics
3. Provide manual of the installed system
4. Ensure system is connected to the cloud as required to communicate with software servers.

D. Software training is typically completed remotely via on-line instruction by Leviton technical support.

3.5 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Meters: Perform inspections and tests listed in NETA ATS, Section 7.11.2.

D. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.

E. Correct deficiencies and replace damaged or defective metering system components.

F. Submit a detailed testing and commissioning procedure to the Consultant and Client for review and approval prior to undertaking this Work. The procedure shall indicate all test equipment required and acceptance criteria.

G. Upon completion of all testing and commissioning, submit a copy of the test results and certify the system as acceptable for revenue metering purposes.

H. Undertake the testing and commissioning Work with the manufacturer's factory representative(s).

3.6 ADJUSTING

A. Program system parameters according to requirements of the County.

3.7 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.8 CLOSEOUT ACTIVITIES

A. See Section 01 79 00 - System Training and Demonstration, for additional requirements.

B. Training: Train the County's personnel on operation, adjustment, and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of two hours of training.

3. Instructor: Manufacturer's authorized representative.

4. Location: At project site.

3.9 PROTECTION

A. Protect installed system components from subsequent construction operations.

END OF SECTION

SECTION 26 27 16 - ELECTRICAL CABINETS AND ENCLOSURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Enclosures.
    a. Cabinets.
    b. Accessories.

B. REFERENCES

1. NEMA 250-2003 - Enclosures for Electrical Equipment (1000 Volts Maximum).
2. NEMA ICS 4-2005 - Industrial Controls and Systems: Terminal Blocks.

C. SUBMITTALS

1. Submit under provisions of Division 1.
2. Product Data
    a. Provide manufacturer’s standard data for enclosures and cabinets.
3. Quality Assurance/Control Submittals
    a. Manufacturer’s Instructions
        1) Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements.

PART 2 PRODUCTS

2.1 ENCLOSURES

A. Construction: NEMA 250, Type 1 steel enclosure.

1. 14 gauge minimum, cold-rolled sheet steel, unless otherwise indicated in the Contract Documents.
2. Cover: Continuous hinge, held closed by flush latch operable by key. Provide interior metal panel for mounting terminal blocks and electrical components; finish with white enamel.
3. Enclosure Finish: Manufacturer’s standard gray enamel.

2.2 CABINETS

A. Description

1. Galvanized Steel, 24 inches 36 inches 6 inches deep unless otherwise indicated in the Contract Documents.
2. Backboard: Provide 3/4 inch thick plywood backboard for mounting terminal blocks. Paint matte white.
3. Doors: Steel, flush or surface type as indicated with concealed hinge, and flush lock keyed to match branch circuit panelboard. Finish with gray baked enamel.
4. Knockouts: Manufacturer's standard.
5. Provide metal barriers to separate compartments containing control wiring operating at less than 50 volts from power wiring.
6. Provide accessory feet for free-standing equipment.
7. Provide six of each type cabinet key.
8. Construction NEMA Type 4:
    a. 14 gauge minimum, cold-rolled sheet steel.
    b. Seams continuously welded and ground smooth. Exterior surfaces shall be free from holes, seams, dents, weld marks, loose scale, or other imperfections and shall not be welded for the attachment of wiring or devices where such holes or fastenings will be visible.
    c. Rolled lip around all sides of enclosure opening to exclude liquids and contaminants.
    d. All exterior hardware shall be stainless steel.
    e. Stainless steel door clamps on three sides of door with lock kit.
    f. Door removed by pulling stainless steel continuous hinge pin.
    g. Door and body stiffeners in larger enclosures.
    h. Collar studs for mounting optional panels.
    i. Finish: Gray polyester powder coating inside and out over phosphatized surfaces.
9. Construction NEMA Type 4X
    a. Same as NEMA Type 4, except Type 304 stainless steel, unpainted.

2.3 ACCESSORIES

A. Terminal Blocks

1. NEMA ICS 4.

2. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, black, rated 600 volts; current rating for circuit, 25 amps minimum.

3. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, black, rated 300 volts; current rating 20 amps minimum.

4. Provide ground bus terminal block, with each connector bonded to enclosure.

5. Wiring Duct

    a. Body: Rigid vinyl (PVC), size for 40 percent fill maximum.

    b. Cover: Hi-impact rigid vinyl, angled and interlocking lips on duct cover and sidewalls permit cover to be snapped on.

PART 3 EXECUTION

3.1 APPLICATION

A. Enclosure Types for Non-hazardous Locations

1. Indoor locations - Provide NEMA type 1.

    a. Exceptions: Provide NEMA type 4x in food handling areas located in central kitchen, retherm kitchens, food service satellites and cafeterias.

    b. Outdoor Locations: Provide NEMA type 4.

        1) NEMA type 3R not permitted.

3.2 INSTALLATION

A. Install Products in accordance with manufacturers' instructions.

B. Install cabinets, cabinet fronts, and enclosures plumb.

C. Anchor securely to wall and structural supports at each corner.

D. Install in accordance with Section 26 05 29.

END OF SECTION

SECTION 26 27 26 - WIRING DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Wall switches.
2. Wall dimmers, LED.
3. Occupancy sensors.
4. Receptacles.
5. Device plates and decorative box covers.
6. Floor box service fittings.
7. Access floor boxes.

B. Related Sections

1. Section 11 98 16 - Detention Fasteners
2. Section 26 01 10 - Electrical General Requirements.
3. Section 26 05 33.13 - Raceway for Electrical Systems.
4. Section 26 08 13 - Acceptance Testing.

C. REFERENCES

1. NEMA WD 1-1999 (R2005) - General Color Requirements for Wiring Devices.
2. NEMA WD 6-2002 - Wiring Devices - Dimensional Requirements.

D. SUBMITTALS

1. Submit under provisions of Division 1.
2. Certify compliance with CEC Article 110 - Requirements for Electrical Installations.
3. Product Data
    a. Provide manufacturer’s catalog information showing dimensions, colors and configurations.
4. Quality Assurance/Control Submittals
    a. Manufacturer’s Instructions

1) Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory requirements contained in Section 26 01 10.

2) Include instructions for storage, handling, protection, examination, preparation, operation and installation of product.

E. MAINTENANCE

1. Extra Materials

a. Provide two of each style, size, and finish wall plate.

PRODUCTS

2.1 WALL SWITCHES

A. Manufacturers:

1. Hubbell.

2. Bryant.

3. Pass and Seymour.

4. General Electric.

5. Slater.

6. Arrow-Hart.

7. Sylvania.

8. Leviton.

B. Description: NEMA WD 1, heavy-duty, AC only general-use snap switch, specification grade.

C. Device Body: Ivory plastic with toggle handle; unless otherwise indicated in the Contract Documents.

D. Indicator Light: Separate pilot strap; red color lens.

E. Voltage Rating: 120-277 VAC.

F. Current Rating: 20 amperes.

G. Ratings: Match branch circuit and load characteristics.

H. Typical Switches:

1. Single-pole: Hubbell 1221-I, Bryant #4901-GI, Pass & Seymour #20AC1-I.

2. Double-pole: Hubbell 1222-I, Bryant #4902-GI, Pass & Seymour #20AC2-I.

3. Three-way: Hubbell 1223-I, Bryant #4903-GI, Pass & Seymour #20AC3-I.
4. Four-way: Hubbell 1224-I, Bryant #4904-GI, Pass & Seymour #20AC4-I.
    a. Single-pole key switch: Hubbell 1221-L, Bryant #4801-L, Pass & Seymour #20AC1-L.
5. Switches with pilot light in red toggle handle:
    a. Handle to light when switch is on.
    b. Hubbell 1221-PL, Bryant #4901-PLR, Pass & Seymour #20AC1-PLR.
6. Narrow switches for hollow metal jamb posts:
    a. Arrow Hart No. QST-91I, with mounting strap No. 1657, Bryant #4641-I with strap #1347, Pass & Seymour #ACD201-I with strap # 347.
7. Three position single-pole, double throw, Hubbell #1385-I, Bryant #4922-I, Pass & Seymour #1225-I.

I. Weatherproof Switches: Where switches are indicated on Drawings as “WP”, the switches shall be of the types specified above, mounted in cast metal box with gasketed weatherproof device plate.

2.2 WALL DIMMERS

A. Description: NEMA WD 1, Type II semiconductor 0-10V dimmer for LED lamps.

B. Device Body: Ivory plastic.

C. Voltage: As required for controlled fixtures.

D. Power Rating: Match load shown on Drawings; 1000 Watts minimum.

E. Accessory Wall Switch: Match dimmer appearance.

2.3 OCCUPANCY SENSORS

A. Manufacturers
1. Wattstopper.
2. Leviton.
3. Lutron.
4. Hubbel.

B. Description: Wall or ceiling mounted.

C. Device Body: Ivory

D. Occupancy sensors in showers shall be listed for wet location.

2.4 RECEPTACLES

A. Manufacturers:

1. Hubbell.
2. Arrow-Hart.
3. Pass & Seymour.
4. General Electric.
5. Slater.
6. Bryant.
7. Sylvania.
8. Leviton Spec-Master series (with nylon face).

B. Description: NEMA WD 1; heavy-duty general-use receptacle.

C. Device Body: Ivory, unless otherwise indicated, plastic.

D. Configuration: NEMA WD 6; type as specified and indicated.

E. Use red devices on “emergency” circuits.

F. Refer to symbol legend, Hubbell Nos. listed unless otherwise noted.

G. Receptacle Outlet; Duplex: 20A, 125V, 2 pole, 3 wire grounding, NEMA 5-20R; ivory (5362-I), red (5362-R).

H. Receptacle Outlet; Simplex: 20A, 125V, 2 pole, 3 wire grounding; NEMA 5-20R; ivory (5361-I), red (5361-R).

I. Hospital Grade Receptacle Outlet; Duplex: 20A, 125V, 2 pole, 3 wire grounding, NEMA 5-20R; Listed as complying with UL 498 Supplement SD, with green dot hospital grade mark on device face; ivory (HBL8300I), red (HBL8300RED).

J. Use hospital grade receptacles in all medical and clinic spaces (i.e. Clinic, Exam, Dentist, etc.).

K. Weatherproof GFCI Receptacle Outlet: 20A, 125V, 3 wire grounding, duplex, with cast metal double lift cover plate for Type “FS” cast metal boxes, including gasket; Hubbell WPFS26.

L. GFCI Type Duplex Receptacle Outlet: Built-in ground-fault circuit interruption, 5-mA sensitivity, with indicator and reset button; UL listed; standard model for ground-fault protection at individual location; feed-through model for ground fault protection of “downstream” conventional receptacles.

1. 20A, 125V, 3 wire duplex: NEMA 5-20R ivory (Arrow Hart GF5242-I), red Arrow Hart GF5242-R).

M. Special Purpose Receptacle Outlet A: 20A, 250V, 2 pole, 3 wire grounding, side and back wired, single: NEMA 6-20 R; ivory (5461-I).

N. Special Purpose Receptacle B: Surge suppression duplex receptacle outlet; NEMA 5-20R .

O. Special Purpose Receptacle Outlet C: 20A, 250V, 3 pole, 4 wire, 3 phase grounding, single: NEMA 15-20R; black (8420).

P. Special Purpose Receptacle Outlet D: 20A, 125/250V, 3 pole, 4 wire, 1 phase grounding, single: NEMA 14-20R; black (8410).

Q. Special Purpose Receptacle Outlet F: 30A, 125V, 2 pole, 3 wire grounding, single; NEMA 5-30R; black (9308).

R. Special Purpose Receptacle Outlet G: 30A, 250V, 2 pole, 3 wire grounding, single; NEMA 6-30R; black (9330).

S. Special Purpose Receptacle Outlet H: 30A, 250V, 3 pole, 4 wire, 3 hose, grounding, single; NEMA 15-30R; black (8430A).

T. Special Purpose Receptacle Outlet J: 30A, 125/250V, 3 pole, 4 wire, 1 phase grounding, single; NEMA 14-30 R; black (9430A).

U. Special Purpose Receptacle Outlet K: 30A, 250V, 2 pole, 3 wire, 1 phase grounding, single, twist-lock; NEMA L6-30R; black (2620).

V. Special Purpose Receptacle Outlet L: 30A, 250V, 3 pole, 4 wire, 3 phase, grounding, single, twist-lock; NEMA L15-30R; black (2720).

W. Special Purpose Receptacle Outlet M: 50A, 250V, 2 pole, 3 wire, 1 phase, grounding, single; NEMA 6-50R; black (9367).

X. Special Purpose Receptacle Outlet N: 50A, 250V, 2 pole, 3 wire, 1 phase, grounding, single, twist-lock; black (25505), with wall plate per NFPA 56A. Portable x-ray receptacle in corridors.

Y. Special Purpose Receptacle Outlet P: 20A, 250V, 2 pole, 3 wire, 1 phase, grounding, single, twist-lock; NEMA L6-20R; black (2320).

Z. Special Purpose Receptacle Outlet Q: 50A, 125/250V, 3 pole, 4 wire, 1 phase, grounding, single; NEMA 14-50R; black (9450A).

AA. Special Receptacle R: 20A, 4 pole, 5 wire, 3 phase Y, 120/208V; NEMA L21-20; black (2510).

BB. Special Receptacle S: 30A, 4 pole, 5 wire, 3 phase Y, 120/208V; NEMA L21-30; black (2810).

CC. Special Purpose Receptacle Outlet U: 15A, 125V, 2 pole, 3 wire, isolated ground, duplex; NEMA 5-15R; orange (IG-5262).

DD. Special Purpose Receptacle Outlet V: 20A, 125V, 2 pole, 3 wire, isolated ground, duplex; NEMA 5029R; orange (IG-5362).

EE. Special Purpose Receptacle Outlet W: 30A, 125V, 2 pole, 3 wire, 1 phase, grounding, single, twist-lock; NEMA L5-30R; black (2610).

FF. Special Purpose Receptacle Outlet X: 20A, 125V, 2 pole, 3 wire, single, twist-lick; NEMA L5-20R; black.

GG. Special Receptacle Outlet Y: 30A, 250V, 2 pole, 3 wire, 1 phase grounding, single, twist lock, isolated ground; NEMA L6-30R; orange (IG-2620).

HH. Special Receptacle Outlet Z: 30A, 4 pole, 5 wire, 3 phase Y, 277/408V; NEMA L22-30, black.

II. Special Receptacle Outlet AA: 60A, 3 pole, 4 wire, 3 phase, 480V; watertight pin and sleeve type; red, Hubbell 460R7W with BB601W 15 degree angle back box.

JJ. Special Receptacle Outlet AB: 60A, 277/480V, 4 pole, 5 wire, single pin and sleeve.

1. Manufacturers:

    a. Appleton Model .

    b. Hubbell; Model 560R7W.

KK. Special Receptacle Outlet AC: 60A, 250V, 3 pole, 4 wire, 3 phase, grounding, single; NEMA 15-60R; black.

1. Manufacturers:

    a. Bryant; Model 8460.

    b. Hubbell; Model 8460A.

    c. Pass & Seymour; Model 5760-BL.

2.5 DEVICE PLATES

A. Device plates for concealed wiring: Same manufacturer as wiring devices, to suit device covered, single or ganged, in one piece with beveled edges that match faces of plates.

1. Minimum Level Device Plate: Type 430 stainless steel flush, satin finish, approximately 20 gauge.

    a. Hollow Metal Jamb Posts: Arrow-Hart #T-1650; Bryant, Stainless Steel.

2. Medium Level Device Plate: Stainless steel; Type 430.

3. Maximum Level Device Plate:

    a. Back Plate: Cold rolled steel; 10 gauge; prime painted.

    b. Cover Plate: Steel; 10 gauge; prime painted.

    c. Fasteners: Minimum 4 security fasteners.

    d. Manufacturers: Fail-Safe; Mark.

4. Cast Metal Plates for Surface Type Boxes: Corrosion resistant cast ferrous metal, designed for application.

5. Plastic Device Plates: Not permitted.

6. Fasteners: Tamper proof metal fasteners under provisions of Section 05 05 23.

B. Device plate locations:

1. Device plates installed in Housing Units, Holding Cells and all other inmate accessible areas shall be Maximum level device plates.

2. Device plates installed in Mechanical Rooms, Central Control Room, and areas 12 feet or more above the finished floor shall be Minimum level device plates.

3. Device plates installed in other areas shall be Medium level device plates.

2.6 FLOOR MOUNTED SERVICE FITTINGS

A. Pedestal-Type Floor-Mounted Duplex Receptacle Outlet: 20A, 125V, 3 wire, grounding, back and side wired, NEMA 5-20R.

1. Horizontal design housing with threaded conduit fitting in base, with satin chromium finish.

2. Hubbell SC3091 with ivory duplex receptacles installed on adjustable 4 inch flush floor box, Hubbell B2529 and cover plate Hubbell S2525 or Walker #523AL, #825SF-CK adpt. kit, #885 box or Steel City #SFH-40-RG, #68-S box.

B. Flush In Floor Receptacles: 20A, 125V, 3 wire, grounding, ivory, NEMA 5-20R.

1. Dual level, fully adjustable box, Hubbell B-2536 or B-2537 with S-3725 power fitting and S-3182 brass carpet flange, Walker #851 Assy. or Steel City #P-60-DU, #604-SC box.

C. Table Mounted Duplex Receptacle Outlet: Similar to floor-mounted pedestal type.

D. Pedestal Communication Outlet: Similar to Paragraph 1.

E. Flush Cover Communication Outlet: Similar to Paragraph 2.

2.7 ACCESS FLOOR BOX

A. Description: Sheet metal box suitable for mounting in access floor system.

B. Size: As required.

C. Cover: Impact resistant plastic.

D. Convenience Receptacle: One.

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions

1. Verify conditions under provisions of Division 1.
2. Verify outlet boxes are installed at proper height.
3. Verify wall openings are neatly cut and will be completely covered by wall plates.
4. Verify floor boxes are adjusted properly.
5. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
6. Verify openings in access floor are in proper locations.
7. Beginning installation means installer accepts existing conditions.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

3.3 INSTALLATION

A. Install products in accordance with manufacturers' instructions.

B. Install products in accordance with CEC.

C. Install devices plumb and level.

D. Install switches with OFF position down.

E. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

F. Do not share neutral conductor on load side of dimmers.

G. Install receptacles with grounding pole on bottom.

H. Except for devices on isolated ground circuits, connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor if present.

I. For isolated ground circuits, connect ground wire directly to device.

J. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

K. Install security device plates. Include installation of backing plates with a minimum of four wall anchors.

L. Connect wiring devices by wrapping conductor around screw terminal.

M. Use jumbo size plates for outlets installed in masonry walls.

N. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

O. Center outlets with regard to paneling, furring, trim, etc.

P. Where several outlets occur in a room, symmetrically arrange them.

Q. Set outlets plumb or horizontal and extending to finished surface of wall, ceiling or floor as case may be without projecting beyond same.

R. Install wall switch 46 inches above finished floor to top of box.

S. Install convenience receptacle in mechanical rooms 46 inches above finished floor to top of box.

T. Install convenience receptacles in locations not specified above at 16 inches above finished floor to bottom of box.

U. Install dimmer 46 inches above finished floor to top of box.

V. Where GFCI receptacles are indicated, install GFCI receptacles at each location. Use of a GFCI receptacle to protect downstream receptacles is not permitted unless otherwise indicated. Do not use GFCI circuit breakers unless specifically indicated.

W. CONSTRUCTION

X. Interface with Other Work

1. Coordinate locations of outlet boxes provided under Section 26 27 29 to obtain mounting heights specified unless otherwise indicated on Drawings. All dimensions are to the center of the item.

2. Install convenience receptacle 4 inches above backsplash of counter or 4 inches above counter if no backsplash.

3. Install Electric Water Cooler outlet boxes centered behind unit, behind Electric Water Cooler cover.

3.4 FIELD QUALITY CONTROL

A. Site Tests

1. Test under provisions of Division 1.
2. Operate each wall switch with circuit energized and verify proper operation.
3. Verify that each receptacle device is energized.
4. Test each receptacle device for proper polarity.
5. Test each GFCI receptacle device for proper operation.

B. Inspection

1. Inspect under provisions of Section 26 08 13.
2. Inspect each wiring device for defects.

3.5 ADJUSTING

A. Adjust work under provisions of Section 26 08 13.

B. Adjust devices and wall plates to be flush and level.

END OF SECTION

SECTION 26 27 29 - EQUIPMENT WIRING SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Electrical connections to equipment specified under other sections.

2. Related Sections

a. Section 22 30 00 - Plumbing Equipment.

b. Section 23 34 23 - HVAC Power Ventilators

c. Section 23 74 13 - Packaged Outdoor Central-Station Air-Handling Units

d. Section 23 81 23.13 - Small-Capacity Split-System Air Conditioners

e. Section 26 01 10 - Electrical General Requirements.

f. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables (600V and Below.

g. Section 26 05 33.13 - Raceway for Electrical Systems.

h. Section 26 27 26 - Wiring Devices.

B. REFERENCES

1. NEMA WD 1-1999 (R2005) - General Color Requirements for Wiring Devices.

2. NEMA WD 6-2002 - Wiring Devices - Dimensional Requirements.

C. SUBMITTALS

1. Submit under provisions of Division 1.

2. Certify compliance with CEC Article 110 - Requirements for Electrical Installations.

3. Quality Assurance/Control Submittals

a. Manufacturer’s Instructions

1) Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements contained in 26 01 10. Include instructions for storage, handling, Protection, examination, preparation, installation, and starting of Product.

D. SEQUENCING AND SCHEDULING

1. Sequence work under provisions of Division 1.
2. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other sections.
3. Determine connection locations and requirements.
4. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.
5. Sequence electrical connections to coordinate with start-up schedule for equipment.

PART 2 PRODUCTS

2.1 CORDS AND CAPS

A. Attachment Plug Construction: Conform to NEMA WD 1. Provide plug equivalent in quality to receptacles provided under Section 26 27 26.

B. Configuration: NEMA WD 6; match receptacle configuration at outlet provided for equipment.

C. Cord Construction: CEC, Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations. Minimum construction shall be 3 conductor, 12 AWG conductors.

D. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions

1. Verify that equipment is ready for electrical connection, wiring, and energization.
2. Conduit system fitting shall be in accordance with Section 26 05 33.13.
3. Wiring and cabling shall be in accordance with Section 26 05 19.
4. Boxes shall be furnished and fitted in accordance with Section 26 05 33.16.

3.2 INSTALLATION

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Provide and install conduit in accordance with Section 26 05 33.13.

C. Provide and install wire in accordance with Section 26 05 19.

D. Provide and install boxes in accordance with Section 26 05 33.16.

E. Make conduit connections to equipment using flexible conduit. Use liquid tight flexible conduit with watertight connectors in damp or wet locations.

F. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.

G. Provide and install receptacle outlet in accordance with Section 26 27 26, where connection with attachment plug is indicated. Provide cord and cap where field-supplied attachment plug is indicated.

H. Provide and install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

I. Provide and install disconnect switches, controllers, control stations, and control devices as indicated.

J. Modify equipment control wiring with terminal block jumpers as indicated.

K. Provide interconnecting conduit and wiring between devices and equipment where indicated.

L. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

3.3 FIELD QUALITY CONTROL

A. Site Tests

1. Demonstrate correct equipment operation to the County Representative.

3.4 SCHEDULES

A. See Drawings for schedule.

END OF SECTION

SECTION 26 28 13 - FUSES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fuses.

B. Spare fuse cabinet.

1.2 RELATED REQUIREMENTS

A. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

B. Section 26 05 73 - Power System Studies: Additional criteria for the selection of protective devices specified in this section.

C. Section 26 28 16.16 - Enclosed Switches: Fusible switches.

1.3 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses 2012.

B. California Electrical Code (CEC) - 2022

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.

    a. Fusible Enclosed Switches: See Section 26 28 16.16.

2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.

3. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

1. Spare Fuse Cabinet: Include dimensions.

B. Maintenance Materials: Furnish the following for the County's use in maintenance of project.

1. Extra Fuses: 10 percent or Three set(s) of three for each type and size installed, whichever is greater.

2. Fuse Pullers: One set(s) compatible with each type and size installed.

3. Spare Fuse Cabinet Keys: Two.

1.6 QUALITY ASSURANCE

A. Conform to requirements of CEC.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience and with service facilities within 100 miles of Project.

C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cooper Bussmann

B. Ferraz Shawmut, Inc

C. Littelfuse

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. UL Class RK-5 fuses: Dual-element time-delay and current-limiting rejection types fuses; UL Class RK-5 listed for 200,000 RMS AIC symmetrical, 0-600A.

1. Manufacturers

a. Bussmann “Fusetron”, 250 V FRN-RK and 600 V FRS-RK.

b. Gould “TRI-ONIC” 250 V TR-R, 600 TRS-R.

c. Littlefuse “SLO-BLO” 250 V FLN-R, 600 V FLS-R.

2. Use for motor feeder and branch circuit devices where fuses are shown.

H. UL Class RK-1 dual-element fuses: Dual-element time-delay and current-limiting rejection type fuses; UL Class RK-1 listed for 200,000 RMS AIC symmetrical, 0-600 A.

1. Manufacturers

a. Bussmann “Low-Peak”, 250 V LPN-RK and 600 V LPS-RK.

b. Littlefuse “Little Peak” 250 V LLN-RK, 600 LLS-RK.

c. Gould “AMPTRAP II” 250 V A2D-R, 600 V A6D-R.

2. Use for main feeder devices 600A and smaller where fuses are shown.

I. UL Class RK-1 single-element fuses: Fast-acting current-limiting rejection type fuses; UL Class RK-1 listed for 200,000 RMS AIC symmetrical, 1/10-600A.

1. Manufacturers

a. Bussmann “Limitron”, 250 V KTN-RK and 600 V KTS-RK.

b. Gould “AMPTRAP” 250 V A2K-R, 600 V A6K-R.

c. Littlefuse 250 V RLN-R, 600 RLS-R.

2. Use where indicated.

J. UL Class L fuses: Dual-element time-delay and current-limiting type fuses; UL Class L listed for 200,000 RMS AIC symmetrical.

1. Manufacturers

a. Bussmann “Hi-Cap” 600 V, 601-6000A, Type KRP-C

b. Gould “AMPTRAP” 600 V 200-600 A Type A4BY

c. Littlefuse “HI-INT” 600 V 601-6000A Type KLP-C.

2. Use for main and main feeder devices over 600A, where fuses are shown.

2.3 SPARE FUSE CABINET

A. Description: Wall-mounted sheet metal cabinet with shelves and hinged door with cylinder lock, suitably sized to store spare fuses and fuse pullers specified.

B. Doors: Hinged, with hasp for the County's padlock.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that mounting surfaces are ready to receive spare fuse cabinet.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify field measurements are as shown on Drawings.

E. Verify that required utilities are available, in proper location, and ready for use.

F. Beginning of installation means installer accepts conditions.

3.2 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

C. Install spare fuse cabinet as directed.

D. Identify spare fuse cabinet in accordance with Section 26 05 53.

E. Provide identification nameplate for spare fuse cabinet in accordance with Section 26 0553.

END OF SECTION

SECTION 26 28 16.16 - ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed safety switches.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 05 73 - Power System Studies: Additional criteria for the selection of equipment and associated protective devices specified in this section.

F. Section 26 28 13 - Fuses.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum) 2013.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.

E. California Electrical Code (CEC) - 2022

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches Current Edition, Including All Revisions.

I. UL 869A - Reference Standard for Service Equipment Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by CEC.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Identify mounting conditions required for equipment seismic qualification.

D. Manufacturer's equipment seismic qualification certification.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

F. Project Record Documents: Record actual locations of enclosed switches.

G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

H. Maintenance Materials: Furnish the following for the County's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. See Section 26 28 13 for requirements for spare fuses and spare fuse cabinets.

1.6 QUALITY ASSURANCE

A. Comply with requirements of CEC.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F and 104 degrees F during and after installation of enclosed switches.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Corporation: www.eaton.com/#sle.

B. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

C. Siemens Industry, Inc: www.usa.siemens.com/#sle.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Seismic Qualification: Provide enclosed safety switches suitable for application under the seismic design criteria specified in Section 26 05 48 where required. Include certification of compliance with submittals.

D. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 7,000 feet.

2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

E. Horsepower Rating: Suitable for connected load.

F. Voltage Rating: Suitable for circuit voltage.

G. Short Circuit Current Rating:

1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.

H. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

I. Provide with switch blade contact position that is visible when the cover is open.

J. Fuse Clips for Fusible Switches: As required to accept fuses indicated.

1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

K. Conductor Terminations: Suitable for use with the conductors to be installed.

L. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

M. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

N. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Outdoor Locations: Type 3R.

O. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

P. Heavy Duty Switches:

1. Comply with NEMA KS 1.

2. Conductor Terminations:

a. Provide mechanical lugs.

b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

2.3 CIRCUIT DISCONNECT SWITCHES

A. Fusible Switch Assemblies: NEMA KS 1; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Designed to accommodate Class R fuses.

1. Provide fuses in accordance with Section 26 05 73.

B. Non-fusible Switch Assemblies: NEMA KS 1; Type HD; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

C. Enclosures: NEMA KS 1; Type 1 indoor, 3R outdoor or type 4 where indicated. Baked enamel over rust-inhibiting primer.

2.4 MOTOR DISCONNECT SWITCHES

A. Provide disconnect for motors as indicated. Disconnects shall be horsepower rated, padlockable, heavy duty; Square D type, Heavy duty; Westinghouse Type H-600; Federal Pacific Class 1240; or approved equal, fused or nonfused as indicated, NEMA 1 indoors; NEMA 3R outdoors conforming to UL 98.

1. Provide fuses in accordance with Section 26 05 73.

2. Size fuses per motor manufacturer’s recommendations.

B. Disconnects for small single-phase motors shall be a horsepower rated, padlockable, manual starter, with overloads, Westinghouse Type B101, Square D, Class 2510, Federal Pacific Class 4003, NEMA 1 indoors or NEMA 3R outdoors conforming to UL 98.

2.5 IDENTIFICATION OF DISCONNECT MEANS

A. Comply with CEC 110-22.

B. Refer to Section 26 05 53 for additional requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and CEC.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 05 26.

H. Provide fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

J. Identify enclosed switches in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 32 16 - DIESEL GENERATOR SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Diesel engine-generator set.
    a. Engine-generator housing and foundation.
    b. Engine-generator control panels.
    c. Related Accessories as specified
2. Related Sections
    a. Section 03 30 00 - Cast-in-Place Concrete.
    b. Section 26 01 10 - Electrical General Requirements.

B. REFERENCES

1. ASTM - A53/A52M-2007 - Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless.
2. ASTM - A193/A193M-2008 - Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications.
3. ASTM - A194/A194M-2008 - Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
4. ASTM - A234/A234M-2007 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
5. MIL-STD 705C-1989 - Generator Test Procedures.
6. NEMA MG-1-2006 - Motors and Generators.
7. NEMA PB1-2006 - Panelboards.
8. NEMA MG-2 2007 - Safety Standard and Guide for Selection, Installation, and Use of Electrical Motors and Generators.
9. IEEE 115-1995 (R2002) - Test Procedures for Synchronous Machines.
10. IEEE C37.20.1-1993 (R1998) - Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear.

11. CSA C22.2, No. 14-M91 Industrial Control Equipment.

12. EN50082-2, Electromagnetic Compatibility-Generic Immunity Requirements, Part 2: Industrial.

13. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.

14. IEC8528 part 4, Control Systems for Generator Sets.

15. IEC Std 61000-2 and 61000-3 for susceptibility, 61000-6 radiated and conducted electromagnetic emissions.

16. IEEE446 Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.

17. California Electrical Code (CEC) - 2022, Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.

18. NFPA 110 - 2022, Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 2, Class 24, Type 10 systems. Level 2 prototype tests required by this standard shall have been performed on a complete and functional unit. Component level type tests will not substitute for this requirement.

19. UL142 – Sub-base Tanks

20. UL1236 – Battery ChargersUL2200. The generator set shall be listed to UL2200 or submit to an independent third party certification process to verify compliance as installed.

21. UL508. The entire control system of the generator set shall be UL508 listed and labeled.

22. UL1236 –Battery Chargers.

1.2 SYSTEM DESCRIPTION

A. Design Requirements

1. The Contractor shall provide a complete emergency generator system, and construct and install all necessary systems, structures, and components described herein. The auxiliaries shall include an engine-generator control system for the engine-generator units. When completed by the Contractor, the emergency generator system shall be a complete and finished facility ready for operation by the County Representative.

2. The Contractor shall design and construct the foundation for the engine-generator set.

3. The equipment shall be furnished ready for operation following normal field installation. All equipment specified herein shall be furnished under the responsibility of a single supplier, and like items shall be provided by a single manufacturer.

4. The Contractor shall provide outdoor, self-standing, acoustical enclosures with access doors, distribution panels, control interface cabinets, and convenience receptacles for each diesel engine-generator set.

1.3 SUBMITTALS

A. Permit Submittals:

1. The engine-generators require Authority to Construct and Permits to Operate from the Air Quality Management District (AQMD). The permit applications shall be prepared and submitted by the Contractor.

2. Submit complete sets of the required information to AQMD for review and approval, with the following:

a. The manufacturer's estimated emissions at 100 percent load in both grams per brake horsepower per hour (gr/bhp-hr) and pounds per hour (lb/hr) of the following:

1) Nitrogen oxide (NOX).

2) Carbon monoxide (CO).

3) Sulfur oxide (SO2).

4) Reactive organic compounds (non-methane hydrocarbons).

5) Particulate matter.

b. Exhaust oxygen concentration expressed as a percent by volume.

c. Exhaust carbon dioxide concentration expressed as a percent by volume.

d. Exhaust temperature.

B. Product Data and Shop Drawings:

1. Product Data Submittal: Product data on control panels and engine-generator sets to include catalog information, technical description, and specifications of all components.

2. Certified dimensional outline and installation drawings showing equipment arrangement and all dimensions, weights, connections, and support requirements. The technical description shall include materials and dimensions of cylinders, pistons, crankshaft and other major parts, a complete list of all accessories that are to be provided.

3. Electrical drawings including circuit schematics, connection and wiring diagrams, and all information necessary for electrical installation.

4. Include battery charger and water jacket heater power requirements. Complete interconnection diagrams showing all interconnecting wiring, recommended wire and conduit sizes, equipment terminal points, and wire identification.

5. Curves showing the engine fuel consumption and kW output.

6. Generator data to include kilowatt and power factor rating, reactance, transient response characteristics, and nameplate information.

7. Description of parts and service availability.

8. Engine data to include continuous horsepower rating and fuel consumption under installed conditions, and cooling water requirements.

9. Control panel drawing showing overall dimensions and arrangement, schematic diagrams and interconnection diagrams.

10. Foundation and seismic zone 4 loading design calculations by a California registered structural engineer. Calculations shall include adequate information such as weight, dimensions, and other details so that they can be fully and independently checked.

11. Foundation, fabrication details and equipment arrangement dimensional outline drawings showing the specific arrangement, weight, and construction of the engine-generator unit and all accessories, including electrical systems, identification of individual engine and generator components (component list) as well as complete definition of materials selection and general method of construction. Drawings and information shall detail the specific unit accessories to be provided under this Contract.

12. Drawings or written specifications detailing the finishes and paint system to be applied to the engine-generator housings.

13. Within 15 days before delivery provide the following:

    a. One copy of the complete training course including all notebooks, references, and training aids.

    b. Complete operation and maintenance manuals as further described herein.

14. Engine-generator mounting details and vibration isolator details.

15. Engine-generator sound attenuated acoustical enclosure layout, elevations and construction details.

16. Electric starter, battery and battery charging system.

17. Generator terminal box layout and details.

18. Integral 120/208 VAC panelboard with circuits for generator ancillary loads.

19. Control interface cabinet layout and wiring diagram, sound attenuated, acoustical enclosure plan.

20. Interconnection diagrams between the control interface cabinet and devices located on the engine-generator set.

21. Grounding reactor sizing calculations, size, weight and enclosure details for the unit.

C. Quality Assurance/Control Submittals:

1. Test Reports:

a. Factory test report.

b. Field test report.

2. Certificates

a. Manufacturer's certificate of proper installation.

b. Field certification.

D. Closeout Submittals

1. Operation and Maintenance Manuals

a. Provide detailed Operation and Maintenance Manuals for the engine-generator unit, control equipment, and all accessories, as required herein, to include the following information illustrated with drawings, schematics, and tables:

1) Complete information on how to operate the engine-generator equipment during startup, sustained operation test conditions, shutdown, and emergency and fault conditions.

2) Information on failure repair including subcomponent (parts) identification and assembly/disassembly diagrams and sketches.

3) Information and data necessary for lubrication, tolerance adjustment, calibration, expendables replacement, and other necessary servicing. Provide detailed definition of all servicing frequencies. Provide all control device set points and calibration sheets for all instrumentation and control sensors.

4) As-built general arrangement and construction drawings, machine cutaways, and parts list for the engine-generator unit and accessories. Copies of all test results, reports, and measurements of operating parameters made on the engine-generator.

5) Information detailing the manufacturer's recommendations for maintenance and operation of the equipment and devices and a parts list with sufficient data for parts identification and ordering of renewal parts.

6) The operation section of the manual shall include a detailed description of the operation philosophy of the control system following the general guidelines described in paragraph 1.9, "Engine-generator Control Panel - Control Requirements".

E. Unit ventilation and combustion air requirements.

F. Location and description of the supplier's parts and service facility within a 100 mile radius of the project, providing on-call service on a 24 hours per day, 7 day per week basis.

G. Complete list of deviations from these specifications.

H. Warranty: Special warranty specified in this Section.

1.4 TRAINING

A. The training program shall consist of classroom lectures and field exercises involving actual operation of the engine-generator units. A training notebook bound in a 8-1/2 inch by 11 inch three-ring binder shall be provided and shall include:

1. Course outline, lesson plans, and fundamental operational theory.

2. Operation manual excerpts including machine cutaway diagrams, materials, etc.

3. Note paper and other materials as needed.

B. Training shall include:

1. Operational theory.

2. Periodic and demand maintenance, including overhauls.

3. Normal startup and shutdowns and normal operation (with hands-on demonstrations).

4. Emergency operating conditions and response with hands-on demonstrations.

C. Training notebooks and training shall be provided for a minimum of ten of the Counties personnel.

1.5 QUALITY ASSURANCE

A. The supplier of the generator set shall be an authorized representative of the manufacturer and shall be located within 100 miles of the installation. The supplier shall provide single source responsibility for warranty, parts, and service.

B. The engine-generator set shall be in compliance, where applicable, with National Fire Protection Association Standard No. 110, Emergency and Standby Power Systems.

C. Manufacturer of engine-generators, engine-generator auxiliaries, and engine-generator control panels shall specialize in manufacturing such equipment and shall have a minimum of 10 years experience manufacturing complete systems of the size specified herein.

1.6 MAINTENANCE ITEMS, SPARE PARTS, AND SPECIAL TOOLS

A. Furnish, tag, mark, securely pack and crate in a hinged-cover box or boxes suitable for shipment and long-term storage, the following items:

1. Three sets - Fuel oil filter elements and gaskets.
2. Three sets - Lubricating oil filter elements and gaskets.
3. Three sets - Air cleaner filter elements.
4. One set - Seals and gaskets for each coolant pump.
5. One set - V-belts for each engine.
6. Three exciter rectifier diodes.
7. One voltage regulator.
8. One lot - Indicating lamps (minimum of 10 percent).
9. One lot - Lamp lenses (minimum of 5 each color).
10. One lot - Low voltage fuses (10 percent of all ratings with a minimum of 3 each rating).
11. Three -Terminal blocks (12 point type).
12. One set - Special tools necessary for routine maintenance and service.
13. One solenoid valve for each type.
14. Three RTD for each type.
15. One jacket water pump and drive.
16. One oil pre-lube pump and drive.

B. Provide a list of spare parts recommended in addition to those specified. Include make, manufacturer, model number, and current price.

1.7 ENGINE-GENERATOR CONTROL PANEL - CONTROL REQUIREMENTS

A. The engine-generator control panel shall provide full control, protection and monitoring of the engine-generator equipment in all possible modes of operation.

B. With the control system in the manual mode, the design of the control system shall permit manual starting and manual stop of the engine-generator sets. Manual starting and stop of the engine-generator set shall be accomplished with a switchboard type start/stop switch spring returned to center position. With the control system in the automatic mode the engine-generators shall be automatically started as previously described.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Include acoustical enclosure,

2. Multiple warranties for individual system components will not be accepted.

3. Warranty Period: Five years from date of Project completion.

1.9 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Project completion, provide 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The diesel engine-generator set and accessories provided under this section shall be the product of one of the following manufacturers:

1. Kohler

2. Caterpillar

3. Cummins

4. Generac

B. Design shown on plans for diesel engine-generator set is based on a Kohler model 500REOZVC with TAD1641GE Volvo engine and 4M4021 alternator unit to establish the minimum requirements and maximum dimensions for the engine-generator system.

2.2 GENERAL

A. Like Items of Equipment: Provide end products of one manufacturer in order to achieve standardization for appearance, operation, maintenance, replacement, and manufacturer's service.

B. Materials: Manufacturer's standard for the intended service unless otherwise specified herein.

C. Duty rating shall be standby.

2.3 SERVICE CONDITIONS

A. Location: Outdoor in level 1 sound attenuating housing.

B. Ambient Temperature: 30 degrees to 83 degrees F.

C. Altitude: 65,000 feet.

D. Fuel Sulfur Content: Maximum 0.5 percent by weight.

2.4 GENERATOR PERFORMANCE REQUIREMENTS

A. Stand-by Power Rating: 475 kW at 0.8 power factor, 480/277 volts; site altitude / temperature de-rated kW: 463.95.

B. Steady-State Voltage Regulation: Not to exceed 0.5 percent.

C. Frequency Regulation: Not to exceed 0.25 percent.

2.5 EQUIPMENT

A. Equipment

1. The generator set is based on Kohler model 500REOZVC with TAD1641GE Volvo engine and 4M4021 alternator unit. The generator set shall provide 475.00 kW when operating at 277/480 volts, 60 Hz, 0.80 power factor. The generator set shall be capable of a 130°C Standby rating while operating in an ambient condition of less than or equal to 83 °F and a maximum elevation of 7000 ft above sea level. The standby rating shall be available for the duration of the outage.

B. Engine

1. The minimum 16.1 liter displacement engine shall deliver a minimum of 903 HP at a governed engine speed of 1800 rpm, and shall be equipped with the following:

a. Electronic isochronous governor capable of 0.25% steady-state frequency regulation

b. 24-volt positive-engagement solenoid shift-starting motor

c. 0-ampere automatic battery charging alternator with a solid-state voltage regulation

d. Positive displacement, full-pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain

e. Dry-type replaceable air cleaner elements for normal applications

f. Engine-driven or electric fuel-transfer pump including fuel filter and electric solenoid fuel shutoff valve capable of lifting fuel

g. The turbocharged engine shall be fueled by diesel

h. The engine shall have a minimum of 6 cylinders and be liquid-cooled

i. The engine shall be EPA certified from the factory

j. The generator must accept rated load in two-steps.

C. Cooling System

1. The engine shall be liquid-cooled by a closed loop, unit mounted radiator rated to operate the generator set at full load at an ambient temperature of 50 degrees C (122 degrees F). The radiator fan and other rotating engine parts shall be guarded against accidental contact.

D. Standard Air Cleaner

1. The air cleaner shall provide engine air filtration which meets the engine manufacturer's specifications under typical operating conditions.

E. Battery

1. Each genset requires a BCI group 31 batteries which must meet the engine manufactures' specifications for the ambient conditions specified in Part 1 Project Conditions and shall comply with the NFPA requirements for engine cranking cycles. Each battery shall be rated according to SAE Standards J-537 with a minimum cold cranking amp of 950 amps and a minimum reserve capacity of 185 Minutes at 80F. The battery plates shall be constructed of a Calcium-Lead alloy to provide long waterless operation and extended battery life. The battery elements must be anchor-locked with full-frame grids and tight-packed commercial plates to resist the effects of vibration. The battery must contain a handle to aid in lifting and the case must be constructed of polypropylene to resist breakage and extend service life. Removable cell covers shall be provided to allow for checking of electrolyte specific gravity.

a. Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.

F. Housing

1. Level 1 Sound Attenuated Enclosure

a. The generator set shall be supplied with a Level 1 Sound Attenuated Enclosure that is UL2200 listed, providing a sound level of 83.1 dB(A) while the generator is operating at 100% load at 7 meters (23 feet) using acoustic insulation and acoustic-lined inlet plenum, constructed from a minimum of 0.125 inch thick formed heavy duty aluminum panels. The acoustic insulation used shall meet UL 94 HF1 flammability classification. The enclosure shall be manufactured from bolted panels to facilitate service, future modifications, or field replacement. The enclosure shall use a vertically louvered air inlet and outlet hood with 90-degree angle to discharge air up and reduce noise. The enclosure shall have an integral rodent guard and skid end caps. The enclosure shall be certified to 150 mph (241 kph) wind load rating. The snow load rating shall be 70 lbs./ sq. ft. or greater.

b. The enclosure components and skid shall be cleaned with a two-stage alkaline cleaning process to remove grease, grit, and grime from parts. Components shall then be subjected to a Zirconium-based conversion coating process to prepare the metal for electro-coat (e-coat) adhesion. All enclosure parts shall receive a 100% epoxy primer electro-coat (e-coat) with high-edge protection. Following the e-coat process, the parts shall be finish coated with powder baked paint for superior finish, durability, and appearance with a Power Armor TM industrial finish that provides heavy duty durability in harsh conditions, and is fade-, scratch- and corrosion-resistant.

c. The enclosure must surpass a 3,000 hour salt spray corrosion test per ASTM B-1117.

d. Enclosures will be finished in the manufacturer's standard color.

e. The enclosures shall allow the generator set to operate at full load based on the cooling capability of the genset. The enclosure will account for no more than a 5°C derating of the ambient cooling capability of the generator.

f. Enclosures shall be equipped with sufficient side and end doors to allow access for operation, inspection, and service of the unit and all options. Minimum requirements are two doors per side. When the generator set controller faces the rear of the generator set, an additional rear facing door is required. Access to the controller and main line circuit breaker shall meet the requirements of the National Electric Code.

g. The enclosure shall be furnished with stainless steel latches, hinges and hardware on the external panels of the enclosure. Access doors shall be rubber sealed to prevent water intrusion and to minimize noise.

h. Doors shall be equipped with lockable latches. Locks shall be keyed alike. Door locks shall be recessed to minimize potential of damage to door/enclosure.

i. A duct between the radiator and air outlet shall be provided to prevent re-circulation of hot air.

j. The complete exhaust system shall be internal to the enclosure.

k. The critical silencer shall be fitted with a tailpipe and rain cap.

l. Enclosure shall have an external emergency stop button that is recessed in the enclosure panel for protection.

m. The generator set enclosure shall be furnished with a load center 120/208/240VAC three phase, 100 a max w/main with sub-feed lugs and 12 branch circuits, (2) 3-way switches, (2) LED lights, and (2) duplex GFI receptacles.

n. The genset alternator shall be furnished with the generator heater wired into the load center.

o. The generator set enclosure shall be furnished with the battery charger wired into the load center.

p. The generator set enclosure shall be furnished with the block heater wired into the load center.

G. Fuel oil storage

1. Double Wall Secondary Containment Sub-base Fuel Tank

a. The generator set shall be supplied with a sub-base fuel tank of sufficient capacity to hold 1038 gallons of diesel fuel and a total run time at full load of 24 hours.

b. The sub-base fuel system shall be listed under UL 142, subsection entitled Special Purpose Tanks EFVT category, and will bear their mark of UL Approval according to their particular classification.

c. The above ground steel secondary containment rectangular tank for use as a sub base for diesel generators is manufactured and intended to be installed in accordance with the Flammable and Combustible Liquids Code—NFPA 30, the Standard for Installation and Use of Stationary Combustible Engine and Gas Turbines—NFPA 37, and Emergency and Standby Power Systems—NFPA 110.

d. The primary tank shall be rectangular in shape and constructed in clam shell fashion to ensure maximum structural integrity and allow the use of a full throat fillet weld.

e. Steel Channel Support System. Reinforced steel box channel for generator support, with a load rating of 5,000 lbs. per generator mounting hole location. Full height gussets at either end of channel and at generator mounting holes shall be utilized.

f. Exterior Finish. The sub-base tank exterior finish shall be Power Armor PlusTM, a polyurea-textured rubberized coating.

g. Normal venting shall be sized in accordance with the American Petroleum Institute Standard No 2000, Venting Atmospheric and Low Pressure Storage Tanks not less than 1-1/4" (3 cm.) nominal inside diameter.

h. The emergency vent opening shall be sized to accommodate the total capacity of both normal and emergency venting and shall be not less than that derived from NFPA 30, table 2-8, and based on the wetted surface area of the tank. The wetted area of the tank shall be calculated on the basis of 100 percent of the primary tank. The vent is to be spring-pressure operated: opening pressure is 0.5/psig and full opening pressure is 2.5 psig. The emergency relief vent is to be sized to accommodate the total venting capacity of both normal and emergency vents.

i. There shall be a 2" NPT opening within the primary tank and lockable manual fill cap.

j. A direct reading, UL listed, magnetic fuel level gauge with a hermetically sealed, vacuum tested dial, to eliminate fogging, shall be provided.

k. A float switch for remote or local annunciation of a (50% standard) low fuel level condition shall be supplied.

l. Decal – The fuel tank will be equipped with a NFPA 704 identification decal.

m. Fuel in basin switch – A FDEP float switch will be installing into the containment basin of the fuel tank. This switch will close a set of contacts if fuel leaks from the main tank and into the containment basin.

    1) The top of the fuel tank will be equipped with a fluid containment area to prevent environmental contamination in the event of an engine fluid spill.

n. Decal – The fuel tank will be equipped with a tank number and a safe fill height decal.

o. Fuel fill option – The fuel fill is equipped with a OSHPD and IBC approved 5 gallon above ground fill/spill container that contains fuel over spills that may occur during fill-ups and will automatic shut off fuel to the tank when the tank becomes 95% full.

p. 3 Alarm Fuel Tank Panel- alarm panel for high, low, and fuel leak.

q. High fuel level switch – A fuel level switch will be installed in the tank and the contacts will close when the fuel level reaches 90%.

r. Fuel fill option – The fuel fill is equipped with a 5 gallon above ground fill/spill container that contains fuel over spills that may occur during fill-ups and the normal vent will be extended to 12’ above the grade.

H. Controller

1. Advanced Power Management 603 (APM603) Generator Set Controller

a. The generator set controller shall be a microprocessor-based control system that will provide automatic starting, system monitoring, and protection.

b. The controller shall be mounted on the generator set and shall have integral vibration isolation. The controller shall be prototype and reliability tested to ensure operation in the conditions encountered.

2. Codes and Standards

a. The generator set controller shall meet NFPA 110 Level 2 requirements and shall include an integral alarm horn as required by NFPA.

b. The controller shall meet NFPA 99 and NEC requirements.

c. The controller shall be UL 6200 recognized.

d. The controller shall meet ASTM B117 (salt spray test).

3. Applicability

a. The controller shall be a standard offering in the manufacturer's controller product line.

b. The controller's environmental specification shall be: -40°C to 80°C operating temperature range and 5-95% humidity, non-condensing.

c. The controller front face shall meet an environmental rating of IP65 when mounted properly on the generator.

4. Controller Buttons, Display, and Components

a. The generator set controller shall include the following features and functions:

1) Master Control Push Buttons – the buttons shall be tactile-feel membrane with an indicator light to initiate the following functions:

a) Run Mode – when in Run mode the generator set shall start.

b) Off/Reset Mode – when in Off/Reset mode, the generator set shall not accept any remote start commands and shall be capable of resetting all faults, allowing for the restarting of the generator set after a shutdown.

c) Auto Mode – when in Auto mode, the generator set shall be ready to accept a signal from a remote device.

2) Control Panel shall include:

a) Emergency Stop Switch – the latch type stop switch shall be red in color with a “mushroom” type head. Depressing the stop button will immediately stop the generator set and lockout the generator set for any automatic remote starting.

b) Alarm Horn – the horn sounds when any faults or warnings are present. The horn shall also sound when the controller in not in the Auto mode.

3) Display – the display shall be a 7” TFT color touchscreen.

4) Fault Light – the controller shall have an annunciator fault light that glows red for faults and yellow for warnings. The warning light will also illuminate when not in Auto.

5) Alarm Silence/Lamp Test Button – when this button is held, it shall test all controller lamps. This button will also silence the alarm horn when the unit is not Auto or has a fault.

6) USB Connection – the controller shall have a USB connection port for a storage device that is accessible on the front of the control panel without having to open any electrical enclosure panels on the generator. This connection shall allow for updating of all software and firmware. This connection shall allow for downloading of controller parameter settings and the event log. This connection shall allow for data logging storage. This connection shall allow the ability to capture screenshots.

7) Mini-USB Connection – the controller shall have a mini-USB connection port for a PC connection that is accessible on the front of the control panel without having to open any electrical enclosure panels on the generator. This connection shall allow a certified technician to service the generator controller using a dedicated PC program. The program shall allow for servicing of generator set parameters, faults diagnostics and viewing of controller information. The program shall allow for uploading of software and firmware as well as downloading of parameter settings and the event log.

5. The controller shall have three user level access

a. User Level – no password required, and user can view all metered values and settings

b. Operator Level – password required to adjust settings that do not impact the generator

c. Technician Level – password required to adjust all settings

6. Overview and Favorites

a. Overview – User shall be able to customize up to 16 gauges for a personalized Home screen that will allow for immediate access to site specific critical data.

b. Favorites – User shall be able to create their own menu set up with parameters for easy viewing.

7. Load Management

a. Programmable outputs included to command the connect and disconnect of loads based on generator or paralleling system state:

1) Loads connected based on available capacity

2) Loads disconnected at system startup

3) Loads disconnected based on a maximum kW setting or under frequency setting

b. Supports up to 16 prioritize load steps per system

1) Can be used on a single generator system

2) Can be combined in a paralleling system for a total system load control capability

c. Simplified load management system view from any generator controller in the system

8. Controller Engine Control Features and Functions

a. User-programmable time delay for engine start.

b. User-programmable time delay engine cool down.

c. Capability to start and run at user-adjustable idle speed during warm-up for a selectable time-period until engine reaches preprogrammed temperature.

d. The idle function including engine cooldown at idle speed.

e. Real-time clock and calendar for time stamping of events.

f. Output with adjustable timer for an ether injection starting system.

g. Programmable cyclic cranking that can adjust on time, off time, and number of cycles.

9. Controller Alternator Control Features and Functions

   a. Patented High-speed RMS Digital Voltage Regulation – the system shall have integral microprocessor-based voltage regulator system that provides + 0.25% voltage regulation no-load to full load with three phase sensing. A separate voltage regulator is not acceptable. The digital voltage regulator shall be applicable to single- or three-phase systems. The system shall be prototype tested and control variation of voltage to frequency. The voltage regulator shall be adjustable at the controller with maximum + 10% adjustable of nominal voltage.

   b. Alternator Thermal Overload Protection – the system shall have integral alternator overload and short circuit protection matched to each alternator for the particular voltage and phase configuration.

   c. Overcurrent Protective Device– the system shall have a thermal trip, instantaneous trip and maintenance mode per NEC240.87.

10. Other Control Features and Functions

   a. Event Logging – the controller keeps a record of up to 10,000 events with date and time locally for warning and shutdown faults. This event log can be downloaded onto a USB storage device or onto a PC through the service program.

      1) Event Snapshot – the control system shall capture 15 seconds of critical data around the time a fault or warning. This data shall be viewable on the controller and downloadable.

   b. Data Logging – the controller shall allow customized parameters to be logged based on a start trigger from the controller interface.

      1) The parameters are selectable from all monitored parameters.

      2) The sample period shall be configurable from 1 second to 1 day.

      3) The collected data shall be stored on a USB storage device plugged into the control panel.

11. Control Monitoring Requirements

   a. The generator set shall have alarms and status indication lamps that show non-automatic status, warning, and shutdown conditions. The controller shall indicate with a warning lamp and or alarm and on the digital display screen any shutdown, warning, or engine fault condition that exists in the generator set system. The following alarms and shutdowns shall exist as a minimum:

1) All monitored functions must be viewable on the control panel display
2) The following generator set functions shall be monitored:
    a) All output voltages - single phase, three phase, line to line, and line to neutral, 0.25% accuracy
    b) All single phase and three phase currents, 0.25% accuracy
    c) Output frequency, 0.25% accuracy
    d) Power factor by phase with leading/lagging indication
    e) Total instantaneous kilowatt loading and kilowatts per phase, 0.5% accuracy
    f) kVARS total and per phase, 0.5% accuracy
    g) kVA total and per phase, 0.5% accuracy
    h) kW hours
    i) A display of percent generator set duty level (actual kW loading divided by the kW rating)
3) Engine parameters listed below shall be monitored: (*are adjustable)
    a) Engine Speed*
    b) Oil Pressure
    c) Coolant Temperature
    d) Runtime Hours
    e) Fuel Pressure
    f) Fuel Consumption Rate
4) Operational records shall be stored in the control beginning at system startup
    a) Total Run Time Hours
    b) Total Loaded Hours
    c) Total Unloaded Hours
    d) Total kW Hours
    e) Controller Hours
    f) Controller Run Time Hours

g) ECM Run Time Hours

h) Number of Starts

i) Number of Crank Attempts

j) Last Crank Duration

k) Last Start Runtime Duration

l) Last Start Time of Day

m) Last Start Date (Day)

n) Last Start Date (Month)

o) Last Start Date (Year)

p) Last Stop Time of Day

q) Last Stop Date (Day)

r) Last Stop Date (Month)

s) Last Stop Date (Year)

5) The following operational records shall be resettable for maintenance purposes:

a) Total Run Time Since Maintenance

b) Loaded Hours Since Maintenance

c) Unloaded Hours Since Maintenance

d) kW Hours Since Maintenance

e) Reset Maintenance Records

6) For maintenance and service purposes, the controller shall store and display on demand the information:

a) Generator Model

b) Generator Serial Number

c) ECM Serial Number

d) Alternator Part Number

e) Engine Model Number

f) Engine Serial Number

g) Controller Serial Number

h) Firmware Version

7) The controller shall support a variety of maintenance parameters including:

a) Last Start Time of Day

b) ECM Runtime Hours

c) Controller Runtime Hours

d) Last Stop Date (Month)

e) Last Start Time of Day

f) Last Stop Date (Day)

g) Last Start Date (Day)

h) Number of Starts

i) Last Stop Time of Day

j) Last Stop Time of Day

k) Controller Hours

l) Number of Crank Attempts

m) Last Crank Duration

n) Last Start Runtime Duration

o) Last Start Time of Day

p) Last Start Time of Day

q) Last Start Date (Month)

r) Last Start Date (Year)

s) Last Stop Time of Day

t) Last Stop Time of Day

u) Last Stop Date (Year)

12. Generator Set Warning, Shutdown Alarm and Status

a. The generator set shall have alarms and status indication lamps that show Non-Automatic Status, Warning, and Shutdown conditions. The controller shall indicate with a warning lamp and/or alarm, and on the digital display screen any shutdown, warning, or engine fault condition that exists in the generator set system. The following alarms and shutdowns shall exist as a minimum:

    1) OverCrank Shutdown
    2) UnderFrequency Shutdown
    3) OverFrequency Shutdown
    4) OverPower Shutdown
    5) Low Oil Pressure Shutdown
    6) High Coolant Temperature Shutdown
    7) Local Emergency Stop Shutdown
    8) Remote Emergency Stop Shutdown
    9) OverSpeed Shutdown
    10) ECM DTCs
    11) Loss ECM Comms Shutdown
    12) ECM Mismatch Shutdown
    13) High Oil Temperature Shutdown
    14) Alternator Protection Shutdown
    15) Protective Relay Shutdown OverPower
    16) Protective Relay Shutdown OverCurrent
    17) Protective Relay Shutdown Reverse VAR
    18) Protective Relay Shutdown ReversePower
    19) UnderVoltage Shutdown (L-L, L-N, each phase)
    20) OverVoltage Shutdown (L-L, L-N, each phase)
    21) OverCurrent Shutdown
    22) Excitation Overvoltage Shutdown
    23) Low Fuel Level Shutdown

24) Low Coolant Level Shutdown

25) Generator Over Power Shutdown

b. Conditions resulting in generator warning (generator will continue to operate):

1) UnderFrequency Warning

2) OverFrequency Warning

3) OverPower Warning

4) Low Oil Pressure Warning

5) Low Coolant Temperature Warning

6) High Coolant Temperature Warning

7) Low Battery Voltage Warning

8) High Battery Voltage Warning

9) Battery Charger Fault Warning

10) High Oil Temperature Warning

11) GFCI Warning

12) UnderVoltage Warning (L-L, L-N, each phase)

13) OverVoltage Warning (L-L, L-N, each phase)

14) OverCurrent Warning

15) High Fuel Level Warning

16) Low Fuel Level Warning

17) Critically Low Fuel Level Warning

18) Generator Over Power Warning

19) ECM DTCs

13. Inputs and Outputs

a. Standard Dedicated User Inputs – the controller shall have dedicated inputs for:

1) Two-Wire Input

a) Remote Engine Start

2) Digital Input

a) Auxiliary Fault (Shutdown)

b) Auxiliary Warning

c) Battery Charger Fault

d) Breaker Close

e) Breaker Trip

f) Coolant Temperature

g) Excitation Over Voltage

h) Fuel Level

i) Fuel Leak Alarm

j) Low Fuel Level Switch

k) Ground Fault Relay

l) Remote Emergency Stop

m) Local Emergency Stop

3) Analog Voltage Input – Scalable Up To + 10 VDC

a) Speed Bias

b) Voltage Bias

b. Standard Dedicated User Outputs – the controller shall have dedicated outputs for:

1) Relay Driver Output

a) Run

b) Crank

c) Horn

d) Common Failure

e) Close Breaker

f) Trip Breaker

c. Optional Configurable User Inputs and Outputs

1) User Configurable Inputs

a) 2 Analog, 0-5 VDC

b) 4 Dry Contact Digital

2) User Configurable Relay Outputs

a) 14 NO/NC Relays

b) 1 Common Fault Relay

d. PLC-like capability for applying logic to customize generator system behavior.

14. Communications

a. CAN

1) If the generator set engine is equipped with an ECM, the controller shall communicate with the ECM for control, monitoring, diagnosis, and meet SAE J1939 standards.

b. Modbus®

1) Non-isolated for RSA III

2) Isolated for Modbus devices

3) Isolated for paralleling communication

4) RJ45 for Modbus TCP, SNMP, and BACnet

c. Simple Network Management Protocol (SNMP)

1) Industry standard SNMP communication shall be available.

2) The controller shall support SNMP communication via an RJ-45 Ethernet connection.

d. BACnet®

1) Industry standard BACnet® communication shall be available.

2) The controller shall support BACnet® communication via an RJ-45 Ethernet connection.

e. Communication Connections

1) All communication connections shall be accessible in a dedicated customer connection area that is separated from factory wiring into the controller to prevent field connections from interfering with factory wiring.

2) The controller shall not require any additional hardware to support Modbus®, SNMP or BACnet® communication.

15. Integrated Parallel Controls Paralleling

a. The controller shall be capable of paralleling with other generators with the same controller through a dedicated communication network between the controllers and onboard paralleling capabilities.

b. The controller shall support paralleling up to eight generators on a common bus.

c. The controller shall support paralleling a single generator with utility using kW, kVAR, and Power Factor settings.

d. Synchronization

1) The controller shall support onboard synchronization to allow matching of voltage, frequency and phase before closing a circuit breaker or contactor to connect the generator to the bus.

2) The controller shall use first-on logic to determine which generator will close to the dead bus first.

3) The controller shall support 3 common forms of synchronizing, Automatic (synch and close breaker), Sync-check (synch-no closure) and Permissive (no active synch, allow manual close if in synch).

4) The controller shall announce a fail to synch fault when synchronization is not achieved within the programmed time delay.

5) The controller shall actively maintain synchronizing efforts to achieve synchronization even after the time delay has expired.

6) The controller shall be capable of actively displaying the synchronizing parameter values for both the generator and the bus when synchronizing; voltage, frequency and phase.

7) The controller shall be capable of displaying the phase rotation (ABC or CBA) for both the generator and the bus and prevent closure to the bus when phase rotation does not match the generator.

e. Load Sharing

1) The controller shall actively share real and reactive power amongst all generators on the common bus, on a per-unit or percentage basis.

2) The controller shall support soft load and unload of the generator.

3) The controller shall be capable of operating with droop control.

f. Circuit Breaker/Contactor Control

1) The controller shall be capable of operating a circuit breaker or contactor to apply electricity to the parallel electrical bus.

2) The controller system shall have a normally closed contact (fail safe) that will keep the breaker tripped until such conditions are met to allow closure.

3) The controller system shall have a normally open contact to provide an energizing signal to close the circuit breaker.

4) The controller system shall have normally open contact for control of a contactor.

5) The controller will announce a Fail to Close warning when closure is not detected after 1 closure attempt.

6) The controller will announce a Fail to Close shutdown when the number of attempts exceeds the setting (max attempts).

7) The controller will monitor current to detect a failure to open the generator circuit breaker.

8) The controller will keep the generator running until the generator circuit breaker is seen open in order to keep the bus live to prevent other devices from closing to this bus without synchronizing.

16. Generator Management

a. Allows the start and stop of generators based on load demand or state of other generators including:

1) Start Power

2) Stop Power

3) Start Accumulator

4) Stop Accumulator

5) Total Online Capacity

6) Total Available Capacity

7) Total Bus Power

8) Total Bus Capacity

9) Negotiated Order

10) Stopped by Gen Management

11) Start Command

b. The generator management can be configured to operate based on:

1) Engine Run Time

2) Fuel Level

3) Manual Order

c. The controller shall have a programmable disconnect point (kW) below which point the controller shall automatically trip the generator circuit breaker.

17. Protective Relays

a. The controller shall provide a standard set of protective relay functions with programmable limits and time delays

1) Over Voltage (59)

a) User adjustable range – 100% to 130%

b) User adjustable range time delay – 0 to 120 seconds

2) Under Voltage (27)

a) User adjustable range – 70% to 100%

b) User adjustable time delay – 0 to 120 seconds

3) Over Frequency (81O)

a) User adjustable range – 100% to 140%

b) User adjustable time delay – 0 to 120 seconds

4) Reverse Power (32R)

a) User adjustable range – 0% to 50%

b) User adjustable time delay – 0 to 120 seconds

5) Over Power (32O)

a) User adjustable range – 90% to 150%

b) User adjustable time delay – 0 to 120 seconds

6) Loss of Field (40 Reverse VARS)

a) User adjustable range – 10% to 100%

b) User adjustable time delays – 0 to 120 seconds

7) Over Current with Voltage Range

a) User adjustable range – 100% to 200%

b) User adjustable time delay – 0 to 120 seconds

18. Generator Overcurrent and Fault Protection

a. The generator shall be provided with a factory installed, 100% rated line circuit breaker rated at 600.00 amperes that is UL489 listed. Line circuit breakers shall be sized for the rated ampacity of the loads served by the breaker per the NEC.

b. The circuit breaker(s) shall incorporate an electronic trip device with the following characteristics:

c. Adjustable long time delay

d. Adjustable short time delay [As applicable]

e. Instantaneous

f. Load side lugs shall be provided from the factory. The line circuit breaker shall include auxiliary contacts, shunt trip, undervoltage trip, alarm switch, and overcurrent switch functionality. Load side breaker connections made at the factory shall be separated from field connections.

g. The shunt trip device shall be connected to trip the generator breaker when the generator-set is shut down by other protective devices.

h. When GFI is required per the NEC, additional neutrals shall be factory installed, and the alarm indication shall be integrated with the generator-set alarms.

i. Barriers to provide segregation of wiring from an emergency source to emergency loads from all other wiring and equipment, if required by the NEC, shall be provided.

19. Alternator

a. The alternator shall be salient-pole, brushless, 2/3-pitch, with 4 bus bar provision for external connections, self-ventilated, with drip-proof construction and amortisseur

rotor windings, and skewed for smooth voltage waveform. The ratings shall meet the NEMA standard (MG1-32.40) temperature rise limits. The insulation shall be class H per UL1446 and the varnish shall be a vacuum pressure impregnated, fungus resistant epoxy. Temperature rise of the rotor and stator shall be limited to 130°C Standby. The PMG based excitation system shall be of brushless construction controlled by a digital, three phase sensing, solid- state, voltage regulator. The AVR shall be capable of proper operation under severe nonlinear loads and provide individual adjustments for voltage range, stability and volts-per-hertz operations. The AVR shall be protected from the environment by conformal coating. The waveform harmonic distortion shall not exceed 5% total RMS measured line-to-line at full rated load. The TIF factor shall not exceed 50.

b. The alternator shall have a maintenance-free bearing, designed for 40000 hour B10 life. The alternator shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.

c. The generator shall be inherently capable of sustaining at least 300% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current-support devices.

d. Motor starting performance and voltage dip determinations shall be based on the complete generator set. The generator set shall be capable of supplying 2,553.00 LRKVA for starting motor loads with a maximum instantaneous voltage dip of 35%, as measured by a digital RMS transient recorder in accordance with IEEE Standard 115. Motor starting performance and voltage dip determination that does not account for all components affecting total voltage dip, i.e., engine, alternator, voltage regulator, and governor will not be acceptable. As such, the generator set shall be prototype tested to optimize and determine performance as a generator set system.

20. Vibration Isolation

a. Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.

2.6 ACCESSORIES

A. Enclosure shall have an external emergency stop button that is recessed in the enclosure panel for protection.

B. The generator set shall be supplied with a 10-ampere automatic float/equalize battery charger capable of charging both lead-acid and ni-cad type batteries, with the following features:

1. Automatic 3-stage float to equalization charge

2. Voltage regulation of 1% from no to full load over 10% AC input line voltage variations

3. Battery charging current Ammeter and battery voltage voltmeter with 5% full-scale accuracy
4. LED lamp for power ON indication
5. Current limited during engine cranking, short circuit, and reverse polarity conditions
6. Temperature compensated for ambient temperatures for -40°C to 60°C
7. Alarm circuit board featuring alarm contacts for low battery voltage, high battery voltage, and battery charger malfunction.
8. UL 1012 Listed
9. CSA Certified

C. Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.

D. The generator shall be supplied with a thermostatically controlled strip heater to prevent the accumulation of moisture and dampness and to maintain the stator windings above the dew point. The heater shall be wired to be “on” at all times that the generator set is not operating.

E. The generator shall be equipped with a crankcase vent. The fumes coming from the vent (Blow-by) will need to be contained with the solids being separated and collected while the gases are being released back into the engine.

F. The air cleaner restriction indicator shall indicate the need for maintenance of the air cleaners.

G. Fuel pressure gauge – A pressure gauge is mounted into the fuel line to display the pressure of the incoming fuel.

H. The generator set shall be supplied with a common failure relay to provide means of signaling fault and/or shutdown conditions.

1. The common failure relay shall remotely signal auxiliary faults, emergency stop, high engine temperature, low oil pressure, overcrank, and over speed via one single-pole, double-throw relay with 10 amps at 120 VAC contacts.
2. The relay contacts shall be gold flashed to allow use of low current draw devices (100ma @ 28VDC min.).
3. Once energized the relay shall remain latched until the system is reset by the main controller switch.

I. The exhaust piping shall be gas proof, seamless, stainless steel, flexible exhaust bellows and includes the flex exhaust tube and the mounting hardware.

J. Supply flexible fuel lines to provide a flexible connection between the engine fuel fittings and the fuel supply tank piping and for the fuel return lines from the injector pump per engine manufacturer's recommendations. Flex line shall have a protective steel wire braid to protect the hose from abrasion.

K. Block Heater - The block heater shall be thermostatically controlled, 2,500 watt, with isolating valves, to maintain manufacturers recommended engine coolant temperature to meet the start-up requirements of NFPA 99 and NFPA 110, Level 1.

L. The generator set shall be provided with a run relay which shall provide a three-pole, double-throw relay with 10-amp/ 250 VAC contacts to indicate that the generator is running. The run relay dry contacts can be used for energizing or de-energizing customer devices while the generator is running (e.g. louvers, indicator lamps, etc.)

M. Remote annunciator panel – The remote annunciator shall meet NFPA 110, Level 1 requirements and enable remote viewing of the generator status. The panel shall be connected to the generator controller via either network communication wires or via hard wired connections. Options shall be available to provide ATS source availability, contactor position, and loaded or unloaded test for up to four transfer switches. The panel shall have the capability to be either flush- mounted or surface-mounted. The annunciator shall meet UL508 requirements.

2.7 SHOP/FACTORY FINISHING

A. The complete engine-generator set, including the instrument panel, shall be given a factory-applied primer and two finish coats of the manufacturer's standard heat-resistant paint. All areas damaged during shipment shall be touched up after installation.

B. Performance Tests:

1. Following installation, the generator set shall be tested in accordance with the requirements of Part 5-13 of NFPA Standard 110. Recorded test data shall be submitted for review.

2. A satisfactory performance test will be required prior to final inspection and acceptance of the work.

2.8 SOURCE QUALITY CONTROL

A. Non-Conforming Work

1. To ensure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.

a. Design Prototype Tests. Components of the emergency system, such as the engine/generator set, transfer switch, and accessories, shall not be subjected to

prototype tests because the tests are potentially damaging. Rather, similar design prototypes and preproduction models shall be subject to the following tests:

1) Maximum power (kW)

2) Maximum motor starting (kVA) at 35% instantaneous voltage dip.

3) Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-32.6.

4) Governor speed regulation under steady-state and transient conditions.

5) Voltage regulation and generator transient response.

6) Harmonic analysis, voltage waveform deviation, and telephone influence factor.

7) Three-phase short circuit tests.

8) Alternator cooling air flow.

9) Torsional analysis to verify that the generator set is free of harmful torsional stresses.

10) Endurance testing.

b. Final Production Tests. Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:

1) Single-step load pickup

2) Safety shutdown device testing

3) Rated Power @ 0.8 PF

4) Maximum power

5) Upon request, a witness test, or a certified test record sent prior to shipment.

c. Site Tests. The manufacturer's distribution representative shall perform an installation check, startup, and building load test. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:

1) Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.

2) Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include: block heaters, battery chargers, alternator strip heaters, remote annunciators, etc.

3) Generator set startup under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during operation, normal and emergency line-to-line voltage and frequency, and phase rotation.

4) Automatic start by means of a simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test.

PART 3 EXECUTION

3.1 GENERAL

A. Care during storage and procedures for installation, lubrication, and startup of the engine-generator set shall be in strict conformance with the manufacturer's instructions.

B. A complete set of manufacturer's instructions covering storage, installation, operation, and maintenance shall be available at the jobsite no later than the date the engine-generator set is received.

3.2 ENGINE-GENERATOR INSTALLATION

A. The engine-generator shall be installed, leveled, and grouted on the equipment pad in accordance with the manufacturer's instructions and recommendations.

3.3 SHOP TESTING ENGINE-GENERATOR SYSTEM

A. The engine and generator shall be shop tested to ensure proper assembly and performance. Tests shall be as described in the following text.

B. Engine-Generator Load Test:

1. Provide a factory load test for each engine-generator unit utilizing appropriate load banks with 0.8 PF and including the following tests, as a minimum:

a. Demonstrate that the engine-generator can be on-line within 10 seconds following a cold start signal with a block load of 50 percent @ 0.8 pf applied at the generator terminal. The voltage and frequency dip shall not exceed 15 percent of rated values.

b. Gradual increase to 100 percent load increments followed by a gradual decrease to 0 percent load in the same manner. Allow 30 minutes of operation at each load

setting and record all required parameters at each setting (both for increase and for decrease).

c. One hour at 25 percent load.

d. One hour at 50 percent load.

e. One hour at 75 percent load.

f. Two hours at 100 percent load.

2. Record all required data for test steps c through f at 15 minute intervals.

3. Data to be recorded for each test step shall include:

   a. Barometric pressure and ambient temperature at intake air inlet.

   b. Jacket water temperature,

   c. Lube oil temperature and pressure,

   d. Speed,

   e. Fuel flow rate, pressure, and temperature,

   f. Noise data in accordance with ANSI and OSHA guidelines. Noise shall be obtained on a 5 foot contour around the unit at approximately 5 foot elevation. All readings shall be corrected to free-field conditions,

   g. Generator winding temperature.

4. Calculated variables to be recorded and reported for each test step shall include:

   a. Brake Mean Effective Pressure (BMEP).

   b. Brake Specific Fuel Consumption (BSFC) (engine-generator load tests steps c through f only).

5. The supplier shall notify the State four weeks in advance of each test and shall provide a complete agenda with minimum one-half-day resolution covering each test. The supplier shall allow the witnessing of each shop test by the County Representative.

6. Each test shall be reported to the County Representative in writing in accordance with the requirements of this Specification.

7. The County Representative will consider minor modification to the test procedures as long as the essence of each test is maintained. Modifications must be obtained in writing from the County Representative at least 6 weeks in advance of the test. The

responsibility for determining acceptability of modification shall rest solely with the County Representative.

C. The engine-generator shall be provided with a shake table test.

3.4 SHOP TESTING GENERATOR

A. Testing: Prior to shipment from the factory, the generator manufacturer shall perform the following tests in accordance with IEEE-115, NEMA MG-2 or MIL-STD 705C. Certified copies of the test reports shall be provided and inspected prior to testing of the complete engine-generator unit.

1. Resistance of all windings (cold).
2. Insulation resistance of all windings.
3. High potential of all windings.
4. Open circuit saturation.
5. Voltage balance on windings.
6. Current balance on windings.
7. Voltage transient at rated KVA.
8. Regulator range test.
9. Phase Sequence.
10. Inherent voltage regulation.
11. Mechanical balance.
12. Three phase build-up short circuit.
13. Circulating current (when applicable).

B. Provide static testing to include high potential test and other NEMA recommended factory tests in accordance with NEMA AND IEEE test procedures. Also, the Series A tests shall be performed in accordance with IEEE No. 115:

1. Establish generator efficiencies, saturation curve, and impedance curve including the determination of armature and field I2R losses, friction and windage losses, and stray load losses.
2. Each test shall be reported to the State in writing in accordance with the requirements of this specification.

3.5 QUALITY CONTROL FOR COMPLETE ENGINE-GENERATOR UNIT (AT MANUFACTURERS' FACILITY)

A. Test the engine-generator set at the manufacturer's facility; demonstrate that engine-generator set satisfies the following tolerances, with respect to specifications.

1. Corrected Power: within 3 percent
2. Test power: within 1 percent
3. Frequency Stability: within 0.2 percent
4. Line-to Line Voltage: within 4 percent
5. Test Voltage: within 1 percent
6. Line Current: within 3 percent
7. Overshoot: 107 percent maximum, High idle RPM
8. Speed Droop: within 1 percent
9. Voltage Stability: less than 0.5 percent, voltage droop
10. Low Idle: within 50 RPM

3.6 ENGINE-GENERATOR CONTROL PANEL WIRING

A. The engine-generator control panel shall be completely wired by the panel manufacturer and shall clearly identify all external wiring connections. External wiring shall enter the control panel from the bottom.

B. Conductors shall not enter or leave a panel except through a terminal block. All secondary and control wiring or connections shall be made with a minimum size wire of No. 12 AWG, 65-strand, tinned copper switchboard wire, CEC type SIS, rated for 600 volts.

C. All annunciator spare alarm points shall be wired to terminal blocks for future connections.

D. Terminal blocks shall have marking strips showing the manufacturer's wire identification numbers. At least 20 percent of the terminals provided shall be spares.

E. Short circuiting type terminal blocks shall be provided for all CT connections and shall be of a type which will maintain firm contact with the shorting device when both terminal screws are removed.

3.7 ENGINE-GENERATOR CONTROL PANEL TESTS

A. The engine-generator panel wiring shall be given a point to point circuit continuity test. The control switches shall be checked for proper contact operation.

B. Device markings, nameplate markings, conductor identifications, and the scale of the meters and instruments shall be checked.

C. The annunciator shall be tested for correct operation.

D. Current, potentials and DC power shall be applied to the proper terminal for testing each position. Meters shall be checked for proper deflection and/or scaling.

E. Control logic shall be tested by simulating starting sequence conditions. Operation of all relays and timers shall be checked.

F. Certified copies of the test data shall be furnished at time of delivery.

3.8 FIELD QUALITY CONTROL

A. Field Tests: Running tests shall be carried out upon completion of the engine installation. The engines shall be operated for a period of not less than 2 hours each and all necessary adjustments made by a factory representative of the engine manufacturer. The test shall demonstrate the ability of the engine-generators to carry the specified loads. Upon completion of the tests, final adjustments shall be made to the equipment, fuel and oil filters shall be replaced, belt drive tensions checked, and the proper operation of all equipment demonstrated to the County Representative. County operation and maintenance personnel shall be instructed in the maintenance and operation of the equipment as designed under Training.

B. An emission source test shall be performed in accordance with AQMD requirements.

C. Manufacturers' Services and Certification:

1. Provide technical services during delivery, installation, and startup by a qualified and factory-trained manufacturer's service representative. Provide a minimum of 20 days of service at the project site approximately allocated as indicated to the tasks defined below:

    a. A written report shall be provided to the County Representative for countersignature describing the condition of each piece of equipment identified by name, equipment number, and crate number. (Approximately 1 day.)

    b. Two installation progress review trips to be scheduled to approximately coincide with 30 percent and 90 percent completion of construction work stages. Each trip shall be scheduled to allow 2 working days spent at the site. The service representative shall review the installation to ensure that the equipment is being installed in accordance with the manufacturer's installation procedures and shall provide a concise written summary trip report for each trip.

c. All reports are to be provided to the County Representative in accordance with the General Requirements no more than 2 weeks after completion of the specified service. (Approximately 4 days total time.)

d. Thorough prestartup inspection of the engine-generator installation including: (Approximately 3 days.)

1) Checking of all fluid levels, expendables (filters, belts, etc.) and assisting in prestartup equipment calibration and tolerance adjustment.

2) Issuance of a Manufacturer's Certificate verifying that the installation is correct and that the equipment is ready for startup and testing.

3) Assistance in conducting initial engine "run-up".

4) Verification of correct operation of all alarms, shutdown interlocks, and startup and shutdown control sequences.

5) Provision of standard ANSI generator startup preparation tests/checks.

e. Assistance in conducting the field tests on each engine-generator set and control panel. (Approximately 5 days total.) If the unit does not perform as specified due to deficiencies in the unit, all time required of the service representative for additional tests shall be provided at no additional cost to the County.

f. Training of the Counties personnel in operation and maintenance of the engine-generators and equipment. (Minimum 6 days or 48 hours.)

3.9 CONTROL AND PROTECTIVE DEVICE TESTS AND ADJUSTMENT

A. All protective devices shall be set to settings on given tap, time dial, time setting, etc., as specified by the County Representative. Devices to be set shall include all auxiliary relays.

B. All control and protective devices shall be visually and mechanically inspected, adjusted, tested and calibrated in accordance with the manufacturer's instruction booklets. Tests shall include testing of each control and protective device for pickup, timing, contact action, restraint and any other pertinent characteristics necessary to ensure its proper calibration and operation.

C. Manually or electrically close each relay's contacts and verify that the proper breaker trip or close and the proper alarm is initiated.

D. Correct any errors in interconnecting wiring or internal equipment wiring as required or as directed by the County Representative to obtain the correct operation of all control and protective devices and associated breakers and/or alarms.

3.10 CONTROL SCHEME TESTING

A. All electrical controls shall be tested by trial operation of control equipment in the presence of the County Representative after all wiring is completed to see that each interlock and control function operates according to the schematic diagrams, the description of operation included in these Specifications, and the manufacturers' schematics and operating instructions.

B. The Contractor shall furnish all necessary labor, supervision, testing equipment, and tools required to locate the cause of any malfunction and shall make the necessary minor wiring or equipment corrections, deletions, or additions necessary to obtain intended operation.

C. All equipment damaged during testing shall be repaired or replaced and put in proper working order. Tighten all test disconnect links and terminal blocks just prior to energizing.

D. Manufacturer's Certificate(s):

1. Provide manufacturer's certificate(s) in accordance with Section MANUFACTURER'S SERVICES of Division 1, GENERAL REQUIREMENTS.

    a. Manufacturer's Certification of Proper Installation.

    b. Field Performance Test Report.

3.11 SERVICE CALL

A. Approximately six months after project completion, a manufacturer's representative shall replace fuel and oil filters, adjust belt drive tensions, operate the unit, and recommend any additional maintenance or adjustments which may be necessary.

3.12 FOUNDATION INSTALLATION

A. The Contractor shall design and construct concrete foundation based on the engine-generator system dimensions, wet weight and as recommended by the equipment manufacturer. Foundation design shall conform to seismic Zone 4 loading. Structural calculations and drawings shall be signed and stamped by a structural engineer registered in the State of California.

B. I=1.5 shall be used for the engine-generator set anchorage.

END OF SECTION

SECTION 26 32 35 - REMOTE GENERATOR ALARM PANEL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Remote Generator Alarm Panel.
2. Related Documents and Sections
    a. Section 26 01 10 - Electrical General Requirements.
    b. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
    c. Section 26 05 29 - Hangers and Supports for Electrical Systems.
    d. Section 26 05 33.13 - Conduit for Electrical Systems.
    e. Section 26 05 33.16 - Boxes for Electrical Systems.
    f. Section 26 05 53 - Identification for Electrical Systems.
    g. Section 26 32 14 - Diesel Engine Generator.

B. REFERENCES

1. NEMA 250-2003 - Enclosures for Electrical Equipment (1000 Volts Minimum).
2. NEMA ICS 4-2005 - Industrial Control and Systems: Terminal Blocks.
3. NFPA 110 – Emergency and Standby Power.

C. SUBMITTALS

1. Submit under provisions of Division 1.
2. Product Data: Provide manufacturer’s standard data for enclosure and cabinets.
3. Manufacturer’s Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

D. PROJECT CONDITIONS

1. Drawings
    a. Electrical plan drawings show only general locations of equipment, devices, and raceway, unless specifically dimensioned.

PART 2 PRODUCTS

2.1 HINGED COVER ENCLOSURE

A. Construction: NEMA 250, Type 1, 16 gauge steel enclosure.

B. Cover: Continuous hinge, held closed by flush latch operable by key.

C. Provide interior metal panel for mounting terminal blocks and electrical components; finish with white enamel.

D. Provide nameplate on enclosure face: “Generator Alarm Panel”

2.2 TERMINAL BLOCKS

A. Terminal Blocks: NEMA ICS 4.

B. Signal Terminals: Module construction type with closed back tubular pressure screw connectors, black, rated 300 volts; current rating 20 amps minimum.

C. Provide ground bus terminal block, with each connector bonded to enclosure.

2.3 ANNUNCIATION DESCRIPTION

A. Provide a L.E.D. indicating light and a nameplate for the following alarm and status

1. conditions:

	Green LEDs appear as steady on when activated. Yellow LEDs slow flash when activated except steady on with EPS supplying load and high battery voltage. Red LEDs slow flash when activated except fast flash with loss of communication and not- in-auto.

B. Provide one audible buzzer (connected to sound at any alarm condition) and an override button (connected to bypass the audible signal) with a nameplate adjacent which reads: “Buzzer Silence”

2.4 ANNUNCIATION DEVICES

A. Provide “Red” L.E.D. indicating lights for each alarm condition. Provide all mounting hardware and accessories for a clean finished installation of L.E.D. indicators.

B. Provide speaker and amplifier as required for audible annunciation of alarm status. Speaker shall be mounted in hinged cover face with perforations. Audible signal shall be a “buzzer” type sound with an override button adjacent to speaker for manual silence of buzzer. Provide all mounting hardware and accessories for a clean finished installation of speaker and override button.

2.5 NAMEPLATES

A. Nameplates: Engraved three-layer laminated plastic, white letters on black background.

B. Letter Size

1. Use 1/8-inch letters for identifying individual alarm status.

2. Use 1/4-inch letters for panel identification.

3. Use all capital letters.

C. Nameplates shall be permanently affixed to panel face.

2.6 EXTRA MATERIALS

A. Provide three (3) L.E.D. light indicators.

B. Provide six (6) sets of keys to lockable cover.

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions

1. Verify that surfaces are ready to receive work.

3.2 INSTALLATION

A. Install Generator Alarm Panel plumb at central control.

B. Anchor to wall and structural supports at each corner.

1. Support in accordance with Section 26 05 29.

C. Fit conduits in accordance with Section 26 05 33 and as indicated.

D. Connect low voltage wiring as indicated.

E. Identify wiring in accordance with Section 26 05 53.

F. Ground and bond in accordance with Section 26 05 26.

3.3 FIELD QUALITY CONTROL

A. Site Tests

1. Test each component for proper operation.

END OF SECTION

SECTION 26 36 00 - TRANSFER SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:

1. Automatic transfer switches.

2. Includes bypass/isolation transfer switches.

3. Remote annunciators.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

1. Includes requirements for the seismic qualification of equipment specified in this section.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 05 73 - Power System Studies: Additional criteria for the selection of equipment specified in this section.

G. Section 26 32 14 - Diesel Generator System with Integrated Paralleling: For interface with transfer switches.

1. Includes code requirements applicable to work of this section.

2. Includes additional testing requirements.

3. Includes related demonstration and training requirements.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

C. NEMA ICS 10 Part 1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment 2020.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.

E. California Electrical Code (CEC) - 2022

F. NFPA 110 - Standard for Emergency and Standby Power Systems 2022

G. UL 1008 - Transfer Switch Equipment Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.

a. Engine Generators: See Section 26 32 14.

2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by CEC.

3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Coordinate the work with placement of supports, anchors, etc. required for mounting.

5. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week before starting work of this section; require attendance of all affected installers.

C. Where work of this section involves interruption of existing electrical service, arrange service interruption with the County.

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.

B. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

1. Clearly indicate whether proposed short circuit current ratings are based on testing with specific overcurrent protective devices or time durations; indicate short-time ratings where applicable.

2. Identify mounting conditions required for equipment seismic qualification.

C. Manufacturer's equipment seismic qualification certification.

D. Specimen Warranty: Submit sample of manufacturer's warranty.

E. Evidence of qualifications for installer.

F. Evidence of qualifications for maintenance contractor (if different entity from installer).

G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

H. Manufacturer's certification that products meet or exceed specified requirements.

I. Field quality control test reports.

J. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

K. Executed Warranty: Submit documentation of final executed warranty completed in the County's name and registered with manufacturer.

L. Maintenance contracts.

M. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

N. Maintenance Materials: Furnish the following for the County's use in maintenance of project.

1. Bypass/Isolation Transfer Switches: Provide accessories (ramps, dollies, etc.) necessary for removal of drawout components.

1.6 QUALITY ASSURANCE

A. Comply with the following:

1. CEC (California Electrical Code).

2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for system Level specified in Section 26 32 14.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

C. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store transfer switches in accordance with manufacturer's instructions.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to transfer switch components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Transfer Switches - Basis of Design: Eaton Corporation.

B. Transfer Switches- Other Acceptable Manufacturers:

1. ASCO Power Technologies: www.ascopower.com/#sle.

2. Thomson Power Systems: www.thomsonps.com/#sle.

3. Same as manufacturer of engine generator(s) used for this project.

C. Substitutions: See Section 01 60 00 - Product Requirements.

D. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, accepts

responsibility for costs associated with any necessary modifications to related work, including any design fees.

E. Source Limitations: Furnish transfer switches and accessories produced by a single manufacturer and obtained from a single supplier.

2.2 TRANSFER SWITCHES

A. Provide complete automatic power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent for connection between emergency power source and norma power source and loads as shown.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide automatic open transition transfer type switches:

1. Switches shall be configured as an open transition (break-before-make) transfer switch and a microprocessor controller to provide automatic operation. Arrangement shall be double-throw power transfer switch mechanism type. The switch shall be mechanically interlocked to ensure only two possible positions, normal and emergency.

2. Switches shall transfer the load with an interruption (open transition) by momentarily disconnecting both sources of power, only when both sources are present and acceptable.

3. The switches shall operate in this conventional mode, break-before-make (open transition), when the power source serving the load fails.

D. The automatic transfer switch shall have solid-state control functions.

E. Automatic transfer switches shall be UL listed per Standard 1008.

F. The transfer switch shall function as a system with the connected generator.

G. The transfer switch shall be provided with integral manual bypass.

H. Applications:

1. Neutral Switching (Single Phase, Three Wire and Three Phase, Four Wire Systems):

a. Unless otherwise indicated or required, provide solid (unswitched) neutral.

I. Comply with NEMA ICS 10 Part 1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).

J. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.

K. Seismic Qualification: Provide transfer switches and associated components suitable for application under the seismic design criteria specified in Section 26 05 48 where required. Include certification of compliance with submittals.

L. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.

M. Enclosures:

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1 or Type 12.

b. Outdoor Locations: Type 3R or Type 4.

2. Provide lockable door(s) for outdoor locations.

3. Finish: Manufacturer's standard unless otherwise indicated.

N. Short Circuit Current Rating:

1. Withstand and Closing Rating: Provide transfer switches, when protected by the supply side overcurrent protective devices to be installed, with listed withstand and closing rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.

2. Short Time Rating: Where the requirement for selectivity is indicated, provide transfer switches with short time ratings suitable for the maximum short time delay setting of the supply side overcurrent protective device.

O. Automatic Transfer Switches:

1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.

2. Control Functions:

a. Automatic mode.

b. Test Mode: Simulates failure of primary/normal source.

c. Voltage and Frequency Sensing:

1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.

2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.

3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.

d. Outputs:

1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).

2) Auxiliary contacts; one set(s) for each switch position.

e. Adjustable Time Delays:

1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.

2) Transfer to alternate/emergency source time delay.

3) Retransfer to primary/normal source time delay.

4) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.

f. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.

3. Status Indications:

a. Connected to alternate/emergency source.

b. Connected to primary/normal source.

c. Alternate/emergency source available.

4. Automatic Sequence of Operations:

a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.

b. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.

c. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.

d. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.

P. Bypass/Isolation Transfer Switches:

1. Description: Factory-assembled units consisting of interconnected transfer switch and bypass/isolation switch that permits manual bypass and isolation of the transfer switch with connection of the load to either source.

2. Bypass/Isolation Switch Type: Provide overlapping (make-before-break) switches with no interruption of power to load. Load break (break-before-make) switches that interrupt power to load are not acceptable.

3. Bypass/Isolation Operation:

a. Operable from exterior of enclosure.

b. Normal Mode: Provides for normal operation of transfer switch.

c. Test Mode: Provides for operational testing of bypassed transfer switch without affecting power to load.

d. Isolate Mode: Provides for complete isolation of transfer switch from all power sources, permitting removal from unit.

Q. Remote Annunciators:

1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.

2. Transfer Switch Status Indications:

a. Connected to alternate/emergency source.

b. Connected to primary/normal source.

c. Alternate/emergency source available.

R. Interface with Other Work:

1. Interface with engine generators as specified in Section 26 32 14.

2.3 RATINGS

A. The transfer switch shall be rated for total system load including inductive and resistive loads.

B. Withstand and closing ratings as determined from the short circuit studies.

C. Pickup voltage shall be adjustable from 85 percent to 98 percent of normal. Dropout voltage shall be adjustable from 75 percent to 98 percent of pickup setting.

D. Engine start time delay shall be 3 seconds, to avoid startups on momentary voltage dips and outages.

E. Main contacts shall be of silver composition with separate arcing surfaces.

F. The transfer switch utilizing molded-case circuit breakers, contactors, or part thereof shall be rated for continuous duty.

G. The transfer switch shall have a full rated neutral with lugs for normal, emergency, and load neutral conductors inside the enclosure.

H. All pilot devices and relays shall be of the industrial type rated 10 amps, with self-cleaning contacts.

2.4 OPERATION

A. On failure of the normal (utility) source, the transfer switch shall automatically transfer to the alternate (generator) source within 10 seconds in accordance with CEC 700.12. Upon restoration of the normal source, the transfer switch shall automatically retransfer.

B. Provide mechanical interlock to prevent simultaneous closing of normal and emergency contacts.

C. The transfer switch shall obtain its operating current from the source to which the load is being transferred.

D. The switch shall transfer the load to emergency power after the generator set reaches proper voltage and frequency. Solid-state time delay transfer shall allow the generator to stabilize before application of load.

E. Solid-state time delay on retransfer shall allow the utility to stabilize and prevent power interruption if return of normal source is momentary.

F. Provide auxiliary contacts for functions indicated. Two minimum for each source.

G. Transfer actuator shall be energized only momentarily during transfer.

H. Provide permanently attached operating handles for manual transfer under load, for switches 1,000 amperes or less.

I. Components of the operating mechanism shall be insulated or electrically dead.

J. All accessories and equipment shall be front accessible for ease of maintenance or removal.

K. Control Functions: (Relays, switches, indicator lamps and equipment to be provided for complete automatic operation).

1. Time delay in transfer to emergency to override momentary voltage disturbances (0.5 to 3.0 seconds).

a. Time delay for retransfer (0 - 25 minutes).

b. Time delay for engine cool down (0 - 10 minutes).

c. Differential voltage sensing on each phase of normal power source; start engine and transfer load if any phase voltage (normal) falls below 80 percent of rated voltage. Retransfer when voltage (normal) on ABC phases has returned to 90 percent of rated voltage.

d. Frequency and voltage sensing of emergency source to prevent transfer to emergency until voltage and frequency are within 90 percent of nominal frequency and rated voltage.

e. Transfer of motor and transformer loads when both normal and emergency loads are energized:

1) Synchronized transfer: within 15 degrees, or

2) Time delay until voltage has delayed to 70 percent of rated voltage.

f. Engine starting contacts to provide signal to engine generator. Provide one normally open and one normally closed contact for engine start signal.

g. Test switch shall simulate loss of normal power for testing of generator set, including transfer of load.

h. Reset button to manually by-pass time delay on retransfer to normal.

i. Two indicating lamps (transformer type) indicating switch position.

L. Built-in control status indicators shall be provided for the following:

1. Normal source available.

a. Emergency source available.

b. Transfer complete.

c. Retransfer complete.

M. Transfer time in either direction shall not exceed 1/6 of a second.

N. Test switch shall simulate loss of normal power for testing of generator set, including transfer of load.

2.5 TESTS

A. Transfer switch and components shall be tested in accordance with UL1008 for the ratings of each switch.

B. Control panel shall meet the voltage surge withstand capability in accordance with ANSI C37.90 and the impulse withstand voltage test in accordance with NEMA ICS 1-109.

C. Factory tests shall include dielectric strength test per NEMA Standard ICS 1-109.05, and the complete unit shall be tested to ensure proper operation of all components and sequence of operation.

D. Short circuit withstand tests to be conducted at full rated voltage in accordance with UL 1008. Transfer switch is to be rated for available RMS short circuit current as a circuit X/R ratio of 6.6.

E. Transient withstand test per IEEE C37.90.1.

F. Each unit shall be subject to a functional test in the field prior to operational testing. Each function shall be tested and demonstrated in the presence of the County Representative. After the functional testing has been completed, operational testing in conjunction with operational testing of the complete emergency generator system shall be conducted and demonstrated in the presence of the County Representative.

G. Submit detailed functional testing and operational test procedures for review by the County Representative prior to testing. Follow approved procedures in conducting field testing and demonstrating.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive transfer switches.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install transfer switches plumb and level.

F. Unless otherwise indicated, mount floor-mounted transfer switches on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.

G. Provide grounding and bonding in accordance with Section 26 05 26.

H. Identify transfer switches and associated system wiring in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. Prepare and start system in accordance with manufacturer's instructions.

B. Automatic Transfer Switches:

1. Inspect and test in accordance with NETA ATS, except Section 4.

2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The insulation-resistance tests listed as optional are not required.

a. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

C. Provide additional inspection and testing as required for completion of associated engine generator testing as specified in Section 26 32 14.

D. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

E. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.4 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.5 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of transfer switches to the County, and correct deficiencies or make adjustments as directed.

B. Training: Train the County's personnel on operation, adjustment, and maintenance of transfer switches.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of four hours of training.

3. Instructor: Manufacturer's authorized representative.

4. Location: At project site.

C. Coordinate with related generator demonstration and training as specified in Section 26 32 14.

END OF SECTION

SECTION 26 43 00 - SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surge protective devices for service entrance locations.

B. Surge protective devices for distribution locations.

C. Surge protective devices for branch panelboard locations.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

1.3 ABBREVIATIONS AND ACRONYMS

A. SPD: Surge Protective Device.

1.4 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

C. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.

D. California Electrical Code (CEC) - 2022

E. UL 1449 - Standard for Surge Protective Devices Current Edition, Including All Revisions.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Architect/Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to ordering equipment.

1.6 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

C. Certificates: Manufacturer's documentation of listing for compliance with the following standards:

1. UL 1449.

2. UL 1283 (for Type 2 SPDs).

D. Operation and Maintenance Data: Include information on status indicators and recommended maintenance procedures and intervals.

E. Project Record Documents: Record actual connections and locations of surge protective devices.

1.7 QUALITY ASSURANCE

A. Comply with requirements of CEC.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.9 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Factory-installed, Internally Mounted Surge Protective Devices:

1. Same as manufacturer of equipment containing surge protective device, to provide a complete listed assembly including SPD.

B. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

C. Source Limitations: Furnish surge protective devices produced by a single manufacturer and obtained from a single supplier.

2.2 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Unless otherwise indicated, provide factory-installed, internally-mounted SPDs.

C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

D. Protected Modes:

1. Wye Systems: L-N, L-G, N-G, L-L.

E. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

F. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

1. Indoor clean, dry locations: Type 1.

2. Outdoor locations: Type 3R.

G. Mounting for Field-installed, Externally Mounted SPDs: Unless otherwise indicated, as specified for the following locations:

1. Provide surface-mounted SPD where mounted in non-public areas or adjacent to surface-mounted equipment.

2. Provide flush-mounted SPD where mounted in public areas or adjacent to flush-mounted equipment.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.

C. Verify system grounding and bonding is in accordance with Section 26 05 26, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and CEC.

C. Unless indicated otherwise, connect service entrance surge protective device on load side of service disconnect main overcurrent device.

D. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26 05 26 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

E. Disconnect SPD prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPD connected.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS Section 7.19.1.

3.4 CLEANING

A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Power supply unit (Drivers)

E. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 09 29 00 - Gpsum Board: Additional requirements for support of ceiling mounted fixtures.

B. Section 09 51 23 - Accoustical Tile Ceilings: Additional requirements for support of ceiling mounted fixtures.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 33.16 - Boxes for Electrical Systems.

E. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 56 00 - Exterior Lighting.

1.3 REFERENCE STANDARDS

A. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns; 2006.

B. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code) 2013 (Corrigendum 2019).

C. IES LM-63 - IESNA Standard File Format for Electronic Transfer of Photometric Data and Related Information 2002 (Reaffirmed 2008).

D. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products 2008.

E. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules 2015, with Errata (2017).

F. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems 2006.

G. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems 2006.

H. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility 2012.

I. California Electrical Code (CEC) - 2022

J. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 844 - Luminaires for Use in Hazardous (Classified) Locations Current Edition, Including All Revisions.

L. UL 924 - Emergency Lighting and Power Equipment Current Edition, Including All Revisions.

M. UL 1598 - Luminaires Current Edition, Including All Revisions.

N. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.

3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.

4. Notify Architect and/or Owner of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

2. Provide photometric calculations where luminaires are proposed for substitution.

3. Provide shop drawings for continuous row luminaires.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

1. Identify fixtures by luminaire schedule number. Show all required features and options; include data relative to lenses for security fixtures.

2. LED Luminaires:

a. Include estimated useful life, calculated based on IES LM-80 test data.

b. Include IES LM-79 test report for proposed substitutions.

3. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format for proposed substitutions.

D. Samples:

1. Provide one sample(s) of each security luminaire.

2. Provide one sample(s) of each custom luminaire.

3. Provide one sample(s) of each luminaire proposed for substitution upon request.

4. Provide one sample(s) of each product finish illustrating color and texture upon request.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

G. Maintenance Materials: Furnish the following for the County's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Materials

a. Provide 10 percent or four, whichever is greater, of each type of tempered glass lens.

b. Provide 5 percent or two, whichever is greater of each plastic and other security lens type.

c. Provide 10 percent or one case, whichever is greater, replacement lamp for each lamp installed.

H. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.6 QUALITY ASSURANCE

A. Conform to requirements of CEC and NFPA 101.

B. Conform to requirements of CBC.

C. Furnish products listed and classified by UL, or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data

1. Submit under provisions of Division 1.

2. Include replacement parts list.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.9 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. Provide warranty under provisions of Division 1.

B. Warrant lenses in writing to County Representative to provide satisfactory performance for 20 years without objectionable discoloration.

C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 LUMINAIRES - GENERAL

A. Furnish products as specified in schedule.

1. GENERAL: Lighting fixtures as hereinafter specified are identified by type as noted on drawings. Fixture specifications are based on construction and performance. Manufacturer's catalogue numbers are of general nature and indicate level of quality required, but do not necessarily reflect complete options as specified. Approval shall be based on description and specification of fixture as well as catalogue number indicated. See specifications for fixture, lens, lamp and ballast requirements. Verify fixture voltage requirements with circuitry indicated on drawings.

2. LED fixtures with self-contained emergency battery packs to be U.L. labeled as "EMERGENCY LIGHTING UNITS".

B. Substitutions: Submit performance calculations for proposed substitutions.

C. Install drivers, and specified accessories at factory.

D. Provide all recessed fixtures with gaskets of rubber, fiberglass, or equivalent material to prevent light leaks around flush trim.

E. Provide standard plaster frame for all recessed lighting fixtures installed in plaster walls or ceilings.

1. Design, finish and fabricate material to preclude possibility of rust stain in plaster.

F. Coordinate fixture types with ceiling construction.

G. Provide pendant fixtures with swivel hangers which will allow fixture to swing in any direction but will not permit stem to rotate.

1. Provide hangers with enclosure rating (NEMA 1, 4, or 7) equal to enclosure requirements of area in which they are installed.

2. Swivel hangers for fixtures in mechanical equipment areas: Shock absorbing type.

H. Pendant mounted LED fixtures, in continuous rows shall be supported by conduit and fasten fixtures to each other or mount on continuous metal channel similar to Unistrut. Provide reflector alignment clips on all industrial LED fixtures mounted in continuous rows.

I. Pendant mounted LED fixtures. Individually mounted to be stem mounted with swivel hangers; 2 for fixtures 1 foot wide and narrower, four for fixtures over 1 foot wide.

2.2 LUMINAIRES

A. Provide products that comply with requirements of CEC.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.

2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.

3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

H. Hazardous (Classified) Location Luminaires: Listed and labeled as complying with UL 844 for the classification of the installed location.

I. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.

2. Tested in accordance with IES LM-79 and IES LM-80.

3. LED Estimated Useful Life: Minimum of 100,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

4. Individual light engine(s) shall be replaceable.

5. LED light engine(s) shall have a minimum lifetime of 100,000+ hours at 40° C and shall have a minimum efficiency of 80 lumens per watt.

6. LED dies shall be tested in accordance with I.E.S.N.A. LM-80-08 standards.

7. Thermal management shall be passive by design and shall consist of heat sinks with no fans, pumps, or liquids.

J. Power supply unit (LED drivers)

1. Luminaires shall be equipped with an LED driver(s) that accepts the voltage as indicated on the “Luminaire (Lighting Fixture) Schedule”. Individual driver(s) shall be replaceable.

2. Driver(s) shall be UL8750 class 2 compliant for their intended purpose.

3. Total harmonic distortion (THD) for current: 20%.

4. Driver(s) shall be rated to operate between -30°C to 50°C minimum.

5. Individual driver(s) shall be equipped with surge protection (6kV minimum) in accordance with IEEE/ANSI C62.4.1. Driver shall be protected against damage due to either an open circuit or short circuit fault condition on the driver output.

6. Driver(s) shall have a minimum efficiency of 85%.

7. Drivers shall deliver full-range dimming from 0-10V control signal.

K. LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.

1. LED Tape - General Requirements:

a. Listed.

b. Designed for field cutting in accordance with listing.

c. Wet Location Applications: IEC 60529, IP 68 (waterproof) rated.

L. Track Lighting Systems: Provide track compatible with specified track heads, with all connectors, power feed fittings, dead ends, hangers and canopies as necessary to complete installation.

M. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.3 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:

1. Sealed maintenance-free lead calcium unless otherwise indicated.

2. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

G. Where indicated, provide units with integral time delay to maintain emergency illumination for 15 minutes after restoration of normal power source.

H. Accessories:

1. Provide compatible accessory mounting brackets where indicated or required to complete installation.

2. Provide compatible accessory high impact polycarbonate vandal shields where indicated.

3. Provide compatible accessory wire guards where indicated.

4. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

2.4 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.

1. Universal mount and complete with factory installed light-emitting diodes (LED's) mounted behind a red diffusing panel.

2. Number of Faces: Single- or double-face as indicated or as required for installed location.

3. Directional Arrows: As indicated or as required for installed location.

B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.

1. Self-Powered Exit Signs:

a. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

b. Battery: Sealed, maintenance-free, nickel cadmium unless otherwise indicated.

c. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

d. Provide low-voltage disconnect to prevent battery damage from deep discharge.

e. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

C. Accessories:

1. Provide compatible accessory high-impact polycarbonate vandal shields where indicated.

2. Provide compatible accessory wire guards where indicated.

D. Manufacturers: Furnish products as indicated in Lighting Fixture Schedule included on the Drawings

2.5 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

D. Fire-Rated Luminaire Enclosures:

1. Provide as required to preserve fire resistance rating of building elements.

2.6 SPARE PARTS

A. The Contractor shall furnish to the Owner at the completion of the project, a minimum of 5% spare LED driver assemblies. LED drivers shall be turned over to the Owner representative in their manufacturer’s protective packaging. LED drivers not in their protective packaging will not be acceptable.

B. The Contractor shall furnish to the Owner at the completion of the project, a minimum of 5% spare LED light engine assemblies. LED light engines shall be turned over to the Owner representative in their manufacturer’s protective packaging. LED light engines not in their protective packaging will not acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with CEC.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Provide required seismic controls in accordance with Section 26 05 48.

F. Provide seismic sway bracing restraints when an installed suspended luminaire's distance from the nearest permanent object (structural, mechanical, etc.) is less than 0.707 of the total suspension cable (stem) length.

G. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

H. Suspended Ceiling Mounted Luminaires:

1. Do not use ceiling tiles to bear weight of luminaires.

2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.

3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.

4. Secure pendant-mounted luminaires to building structure.

5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.

6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.

7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

I. Recessed Luminaires:

1. Install trims tight to mounting surface with no visible light leakage.

2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.

3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

J. Suspended Luminaires:

1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.

2. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet between supports.

3. Install canopies tight to mounting surface.

4. Unless otherwise indicated, support pendants from swivel hangers.

K. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).

L. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

M. Support luminaires larger than 2 x 4 foot size independent of ceiling framing.

N. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.

O. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

P. Exposed Grid Ceilings: Support surface mounted luminaires in grid ceiling directly from building structure.

Q. Install recessed luminaires to permit removal from below.

R. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

S. Install clips to secure recessed grid-supported luminaires in place.

T. Install wall mounted luminaires and exit signs at height as indicated on Drawings.

1. Where not indicated mount:

a. Exit lights - 90 inches above floor. Center in space over door frame where applicable.

b. Bracket light above lavatory - 78 inches above floor.

U. Install accessories furnished with each luminaire.

V. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture; use flexible conduit.

W. Connect luminaires and exit signs to branch circuit outlets provided under Section 26 05 33.16 using flexible conduit.

X. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

Y. Bond products and metal accessories to branch circuit equipment grounding conductor.

Z. Install specified lamps in each exit sign and luminaire.

AA. Emergency Lighting Units:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

2. Install lock-on device on branch circuit breaker serving units.

BB. Exit Signs:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

2. Install lock-on device on branch circuit breaker serving units.

CC. Identify luminaires connected to emergency power system in accordance with Section 26 05 53.

DD. Where a switched fixture with battery backup is used, connect an unswitched lead to the emergency ballast.

EE. Maintain fire rating of ceiling where luminaire are installed.

FF. Install lamps in each luminaire.

3.4 INSTALLATION - SECURITY TYPE

A. In addition to the requirements elsewhere, the following requirements shall be met:

1. Each maximum or medium security fixture to be attached to concrete structure shall be attached with six 3/8 inch Hilti Kwik Bolts or equivalent with a minimum embedment of 2 inches. Each bolt shall support a minimum of 3000 pound tension in 4,000 psi concrete.

2. Each maximum or medium security fixture to be attached to concrete masonry security wall shall be attached with a minimum of six Hilti Kwik Bolts or equivalent, minimum 3/8 inch diameter, with a minimum embedment of 4 inches into the filled cell of the masonry unit. Do not install bolt at any other point in the masonry unit.

3. Each minimum security fixture to be attached to concrete structure shall be attached with four 3/8 inch Hilti Kwik Bolts or equivalent with a minimum embedment of 2 inches. Each bolt shall support a minimum of 3,000 pound tension in 4,000 psi concrete.

4. Each minimum security fixture to be attached to concrete masonry security wall shall be attached with four 3/8 inch Hilti Kwik Bolts or equivalent with a minimum embedment of 4 inch into the filled cell of the masonry unit. Do not install bolt at any other point in the masonry unit.

5. Each security fixture attached to suspend ceiling system shall be attached with threaded bolt through ceiling to steel channel rigidly attached to ceiling suspension system. Number of bolts as specified by security level of fixture. Mount tight to ceiling.

3.5 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Perform field inspection, testing, and adjusting in accordance with Section 01 4000.

D. Operate each luminaire after installation and connection to verify proper operation.

E. Test self-powered exit signs and emergency lighting units to verify proper operation upon loss of normal power supply.

F. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect/Engineer.

3.6 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect/Engineer. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect/Engineer or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect/Engineer or authority having jurisdiction.

D. Aim and adjust fixtures as directed.

E. Position exit sign directional arrows as indicated.

3.7 CLEANING

A. Clean Work under provisions of Division 1.

B. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

C. Clean electrical parts to remove conductive and deleterious materials.

D. Remove dirt and debris from enclosures.

E. Clean finishes and touch up damage.

3.8 DEMONSTRATION

A. Provide systems demonstration under provisions of Division 1.

B. Provide minimum of two hours demonstration of luminaire operation.

3.9 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to Architect/Engineer, and correct deficiencies or make adjustments as directed.

3.10 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

3.11 SCHEDULE - SEE DRAWINGS

END OF SECTION

SECTION 26 56 00 - EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior luminaires.

B. Poles and accessories.

C. Luminaire accessories.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 33.16 - Boxes for Electrical Systems.

E. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

F. Section 26 27 26 - Wiring Devices: Receptacles for installation in poles.

G. Section 26 51 00 - Interior Lighting.

1.3 REFERENCE STANDARDS

A. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns; 2006.

B. IEEE C2 - National Electrical Safety Code 2017.

C. IES LM-63 - IESNA Standard File Format for Electronic Transfer of Photometric Data and Related Information 2002 (Reaffirmed 2008).

D. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products 2008.

E. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules 2015, with Errata (2017).

F. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

G. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems 2006.

H. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts 2016.

I. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility 2012.

J. California Electrical Code (CEC) - 2022

K. UL 844 - Luminaires for Use in Hazardous (Classified) Locations Current Edition, Including All Revisions.

L. UL 1598 - Luminaires Current Edition, Including All Revisions.

M. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.

2. Notify Architect and/or District Representative of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Coordination: Furnish bolt templates and pole mounting accessories to installer of pole foundations.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

2. Provide photometric calculations where luminaires are proposed for substitution.

3. Provide structural calculations for each pole proposed for substitution.

C. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

D. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1. Identify fixtures by luminaire schedule number. Show all required features and options; include data relative to lenses for security fixtures.

2. Submit lighting level performance data where indicated as required or where an approval of a listed fixture is requested. Provide all assumptions. Indicate whether calculated or measured.

3. LED Luminaires:

    a. Include estimated useful life, calculated based on IES LM-80 test data.

    b. Include IES LM-79 test report for proposed substitutions.

4. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format for proposed substitutions.

5. Lamps: Include rated life and initial and mean lumen output.

6. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

E. Sustainable Design Documentation: Submit manufacturer's product data on lamp mercury content and rated lamp life, showing compliance with specified requirements.

F. Test Reports: Indicate measured illumination levels.

G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

H. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

I. Maintenance Materials: Furnish the following for the County's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Materials

    a. Provide 10 percent or four, whichever is greater, of each type of tempered glass lens.

    b. Provide 5 percent or two, whichever is greater of each plastic and other security lens type.

    c. Provide 10 percent or one case, whichever is greater, replacement lamp for each lamp installed.

J. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.6 QUALITY ASSURANCE

A. Conform to requirements of CEC.

B. Conform to requirements of CBC.

C. Furnish products listed and classified by UL, or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 WARRANTY

A. Provide warranty under provisions of Division 1.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 LUMINAIRES

A. Provide products that comply with requirements of CEC.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

H. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.

2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.

3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

I. Hazardous (Classified) Location Luminaires: Listed and labeled as complying with UL 844 for the classification of the installed location.

J. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

K. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.

2. Tested in accordance with IES LM-79 and IES LM-80.

3. LED Estimated Useful Life: Minimum of 100,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.3 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).

2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

3. Luminaires shall be equipped with an LED driver(s) that accepts the voltage as indicated on the “Luminaire (Lighting Fixture) Schedule”. Individual driver(s) shall be replaceable.

4. Driver(s) shall be UL8750 class 2 compliant for their intended purpose.

5. Total harmonic distortion (THD) for current: 20%.

6. Driver(s) shall be rated to operate between -30°C to 50°C minimum.

7. Individual driver(s) shall be equipped with surge protection (6kV minimum) in accordance with IEEE/ANSI C62.4.1. Driver shall be protected against damage due to either an open circuit or short circuit fault condition on the driver output.

8. Driver(s) shall have a minimum efficiency of 85%.
9. Individual light engine(s) shall be replaceable.
10. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

2.4 POLES

A. All Poles:

1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
2. Material: Steel, unless otherwise indicated.
3. Shape: Round straight, unless otherwise indicated.
4. Finish: Match luminaire finish, unless otherwise indicated.
5. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
6. Unless otherwise indicated, provide with the following features/accessories:
   a. Top cap.
   b. Handhole, 2"x4" size.
   c. Anchor bolts with leveling nuts or leveling shims.
   d. Anchor base cover.
   e. Provision for pole-mounted weatherproof GFI receptacle where indicated.
   f. Brackets: as required.

B. Metal Poles: Provide ground lug, accessible from handhole or transformer base.

2.5 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

D. Poles: Per drawing. .

2.6 SPARE PARTS

A. The Contractor shall furnish to the Owner at the completion of the project, a minimum of 5% spare L.E.D. driver assemblies. LED drivers shall be turned over to the Owner representative in their manufacturer's protective packaging. LED drivers not in their protective packaging will not be acceptable.

B. The Contractor shall furnish to the Owner at the completion of the project, a minimum of 5% spare L.E.D. light engine assemblies. LED light engines shall be turned over to the Owner representative in their manufacturer's protective packaging. L.E.D. light engines not in their protective packaging will not acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with CEC.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Provide required seismic controls in accordance with Section 26 05 48.

F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

G. Recessed Luminaires:

1. Install trims tight to mounting surface with no visible light leakage.
2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

H. Suspended Luminaires:

1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
2. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet in length, with no more than 4 feet between supports.
3. Install canopies tight to mounting surface.
4. Unless otherwise indicated, support pendants from swivel hangers.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to bottom of luminaire.

J. Pole-Mounted Luminaires:

1. Maintain the following minimum clearances:
   a. Comply with IEEE C2.
   b. Comply with utility company requirements.
2. Foundation-Mounted Poles:
   a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 30 00.
      1) Install anchor bolts plumb per template furnished by pole manufacturer.
      2) Position conduits to enter pole shaft.
   b. Install foundations plumb.
   c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
   d. Tighten anchor bolt nuts to manufacturer's recommended torque.
   e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
   f. Install anchor base covers or anchor bolt covers as indicated.
3. Grounding:

a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.

4. Install separate service conductors, size as indicated on drawings, from each luminaire down to handhole for connection to branch circuit conductors.

5. Install weather resistant GFI duplex receptacle with weatherproof cover as specified in Section 26 27 26 in designated poles.

K. Install accessories furnished with each luminaire.

L. Bond products and metal accessories to branch circuit equipment grounding conductor.

M. Provide concrete bases for lighting poles at locations indicated, in accordance with detail on drawing and Section 03 3000.

N. Install lamps in each luminaire.

O. INSTALLATION - SECURITY TYPE

1. In addition to the requirements elsewhere, the following requirements shall be met:

a. Each maximum or medium security fixture to be attached to concrete structure shall be attached with six 3/8 inch Hilti Kwik Bolts or equivalent with a minimum embedment of 2 inches. Each bolt shall support a minimum of 3000 pound tension in 4,000 psi concrete.

b. Each maximum or medium security fixture to be attached to concrete masonry security wall shall be attached with a minimum of six Hilti Kwik Bolts or equivalent, minimum 3/8 inch diameter, with a minimum embedment of 4 inches into the filled cell of the masonry unit. Do not install bolt at any other point in the masonry unit.

c. Each minimum security fixture to be attached to concrete structure shall be attached with four 3/8 inch Hilti Kwik Bolts or equivalent with a minimum embedment of 2 inches. Each bolt shall support a minimum of 3,000 pound tension in 4,000 psi concrete.

d. Each minimum security fixture to be attached to concrete masonry security wall shall be attached with four 3/8 inch Hilti Kwik Bolts or equivalent with a minimum embedment of 4 inch into the filled cell of the masonry unit. Do not install bolt at any other point in the masonry unit.

e. Each security fixture attached to suspend ceiling system shall be attached with threaded bolt through ceiling to steel channel rigidly attached to ceiling suspension system. Number of bolts as specified by security level of fixture. Mount tight to ceiling.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Perform field inspection, testing, and adjusting in accordance with Section 01 4000.

D. Operate each luminaire after installation and connection to verify proper operation.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect/Engineer.

F. Measure illumination levels to verify conformance with performance requirements. Take measurements during night sky, without moon or with heavy overcast clouds effectively obscuring moon.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect/Engineer. Secure locking fittings in place.

B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect/Engineer.

3.6 CLEANING

A. Clean Work under provisions of Division 1.

B. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

C. Clean electrical parts to remove conductive and deleterious materials.

D. Remove dirt and debris from enclosure.

E. Clean finishes and touch up damage.

3.7 DEMONSTRATION

A. Provide systems demonstration under provisions of Division 1.

B. Provide minimum of two hours demonstration of luminaire operation.

3.8 CLOSEOUT ACTIVITIES

A. See Section 01 79 00 - System Training and Demonstration, for additional requirements.

B. Demonstration: Demonstrate proper operation of luminaires to Architect/Engineer, and correct deficiencies or make adjustments as directed.

3.9 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 27 00 00
COMMUNICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. The work outlined in this specification section is the general administrative overview for all communications systems installed under Division 27.

1.2 SCOPE

A. Submittals
B. Contractor Installation Shop Drawings
C. Warranty, Testing, and Commissioning
D. Contractor Record Closeout Documents

1.3 RELATED REQUIREMENTS

A. Division 27, Communications

1. Division 27 05 00 – Common Work Results for Communications
2. Division 27 06 00 – Schedules for Communications
3. Division 27 10 00 – Structured Cabling
4. Division 27 11 00 – Communications Equipment Room Fittings
5. Division 27 13 00 – Communications Backbone Cabling
6. Division 27 15 00 – Communications Horizontal Cabling
7. Division 27 21 00 – Data Communications Network Equipment
8. Division 27 30 00 – Voice Communications
9. Division 27 41 00 – Audio-Video Communications
10. Division 27 42 00 – Electronic Digital Systems
11. Division 27 51 00 – Distributed Audio-Video Communications Systems
12. Division 27 51 26 – Assisted Listening Systems
13. Division 27 53 00 – Distributed Systems

1.4 CODES AND STANDARDS

A. The installed system shall confirm to all California State Codes

1. 2022 California Building Code (CBC)
2. 2022 California Electrical Code (CEC)
3. 2022 California Fire Code (CFC)
4. All equipment connected to the Fire Alarm system shall have California State Fire Marshall listing(s).

B. National Codes

1. 2017 NFPA 70 – National Electrical Code
2. 2016 NFPA 72 – National Fire Alarm Code
3. 2018 NFPA 101 – Life Safety Code
4. Americans with Disabilities Act (ADA)
5. Local building codes

C. All requirements by the authority having jurisdiction (AHJ)

D. Telecommunications Industry Association Standards (TIA)

1. TIA 526-7: Single Mode Fiber Standards
2. TIA 526-17: Multi Mode Fiber Standards
3. TIA-568-D.1: Commercial Building Telecommunications Cabling Standards.
4. TIA-568-C.2: Balanced Twisted-Pair Telecommunications Cabling and Components Standards.
5. TIA-569-E: Telecommunications Pathways and Spaces.
6. TIA-606-C: Administration Standard for Telecommunications Infrastructure.
7. TIA-607-D: Generic Telecommunications Bonding and Grounding (Earthing) Requirements for Customer Premises.

E. Audio-Visual and Integrated Experience Association (AVIXA)

1. A102.01.2017: Audio Coverage Uniformity in Listener Areas (ACU)
2. 10:2013 Audio-Visual System Performance Verification
3. F501.01:2015: Cable Labeling for Audio-Visual Systems
4. V201.01: Projected Image System Contrast Ratio
5. F502.02:2018: Rack Building for Audio-Visual Systems
6. A103.01: Sound System Spectral Balance
7. A104.01: Sound System Dynamic Range

PART 2 PRODUCTS

2.1 N/A

PART 3 EXECUTION

3.1 SUBITTALS

A. Products Material Submittal:
   1. Product data and manufacturer's installation instructions for information, communications, and technology systems electronically in PDF and XLS format, as required. The PDF shall include bookmarks for each section of the submittal.
   2. A Microsoft Excel spreadsheet listing each item submitted as a separate row. The spreadsheet shall, at a minimum, contain the following columns:
      a. Submittal #,
      b. Item # (tied to PDF cut sheet)
      c. Spec section submitted
      d. Drawing sheet referenced
      e. Manufacturer
      f. Part number
      g. Description

B. Products Material substitutions

1. If the Contractor desires to use any other brand or manufacturer of equal quality and utility to that specified, they shall make application to the Owner/Architect/Engineer in writing, and shall submit samples, if requested. Such application constitutes a recommendation that the Contractor:
   a. Has investigated proposed product and determined that it meets or exceeds, in all respects, specified product.
   b. Will provide the same warranty for equal as for specified product.
   c. Will coordinate installation and make other changes, which may be required for work to be complete in all respects.
   d. Waives claims for additional costs, which may subsequently become apparent.
   e. The Architect/Designer/Engineer will determine whether or not the proposed material is equal in quality and utility to the material specified, and their decision shall be final.
   f. Requests for equal materials will only be considered when offered by the Contractor as required by this section

C. Whenever in the Contract Documents any materials, products, processes, or articles are indicated or specified by the name brand of the manufacturer, or by patent or proprietary names, such specifications shall be deemed to be a measure of quality and utility or a standard and shall be deemed to be followed by the words, “or equal.” It is the intent of this article to comply with Public Contract Code Section 3400.

3.02 CONTRACTOR INSTALLATION SHOP DRAWINGS

A. Contractor installation “Shop Drawings” requirements

1. The Contractor Installation Shop Drawings represent the level of system design to be provided to the Owner/Architect/Engineer. Contractor shall provide all additional system design work required, including:
   a. Conduit layout and sizing.
   b. Wire and cable layout and sizing.
   c. Point-to-point wiring and equipment hook-up information.
   d. Equipment mounting details.
      i. Design of equipment cabinets, including front rack elevations with accurate equipment rack unit spacing and equipment schedules.
      ii. MDF / IDF room wall elevations for all systems, junction boxes, wall mounted equipment, power outlets etc., mounted on each wall.
      iii. MDF / IDF room top view to show placement of equipment racks or cabinets, including required 36” clearance from mounted equipment.
   e. Other detailed design work required.
   f. Contractor’s design shall conform to all applicable codes and ordinances. All electrical design, including the sizing and placement of conduit, raceways and conductors, shall be in accordance with NFPA 70: National Electrical Code, current version, unless local codes establish more stringent requirements.
   g. Contractor’s design work is subject to review and approval by the Owner/Architect/Engineer, Project Construction Manager.
2. It shall be understood that the drawings, details, and one-lines provided with the design package are diagrammatic and/or performance based. Data presented on design drawings are as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification, of all dimensions, routing, etc., by the contractor is required.
3. Drawings are provided to show the intent of the design and specification and to assist the

contractor in submitting a bid. Contractor is directed to make field surveys as part of his work prior to submitting systems installation shop drawings. The contractor shall make allowance in the proposal to cover whatever work is required to comply with the intent of the design and provide a fully functioning complete, operable, and integrated system.

4. In case of doubt of work intended, it is the responsibility of the Contractor to request instructions from the Owner/Architect/Engineer prior to bid. The contractor shall be responsible for installing a complete, operable, integrated and functioning system to the Owners satisfaction.
5. Installation of the systems shall not be started until detailed contractor furnished shop drawings (in AutoCAD 2020 or similar professional drawing format) and product submittals have been approved by the designer and/or architect and if (a. Applicable, approved by the Division of the State Architect).
6. Any and all design and/or installation discrepancies, change orders, (including labor, materials, and shipping) incurred without contractor shop drawings or after contractor shop drawings have been approved shall be the sole responsibility of the contractor.
7. Any work performed without approved contractor furnished shop drawings and submittals shall not be allowed. If work performed prior to approve shop drawings, contractor will do so at their own risk.

3.3 WARRANTY, TESTING, AND COMMISSIONING

A. Warranty:

1. All components, parts, and installation supplied by the contractor shall be guaranteed against defects in materials and workmanship for one (1) year from date of Notice of Completion or system acceptance, whichever falls later. Labor to repair, reprogram, or replace components shall be furnished by the contractor at no charge during the warranty period.
2. All warranty work of a minor nature shall be performed during hours when site and/or buildings are not occupied, Monday through Friday. Major warranty work, defined as, affecting more than 15% of the system, causing complete operator workstation or server failure, or work involving life safety shall be responded to within four (4) hours. Major warranty work shall be performed regardless of normal work hours or days until corrected.
3. All fiber optic data installs shall carry a Limited Lifetime warranty. This will require the contractor to certify their installers to the manufactures guidelines and submit their certifications with bid documents for the project.
4. Copper (Cat6/Cat6A) network cabling installs for this project shall carry a Limited Lifetime warranty. This will require the contractor to certify their installers to the manufactures guidelines and submit their certifications with bid documents for the project.

3.4 CONTRACTOR RECORD CLOSEOUT DOCUMENTS

A. The Contractor shall provide, at the completion of the project, Project Record Documents and furnish to the Owner one (1) Electronic Copy set of record drawings. The Contractor Record Closeout Documents shall be prepared in such a manner that each ASI, RFI, CCD, PCO is noted and clouded on the Contractor Record Closeout Documents.
B. The Contractor shall provide an electronic copy of the field redline drawings in PDF format.
C. The electronic Contractor Record Closeout Documents shall follow the following standards:
    1. Delivered as an electronic set of documents on a CD-R or a memory stick clearly labeled with Job Number, Bid Number and Name of Project.
    2. Drawing standards, such as line-types, line-weights, fonts and symbols shall be consistent with the bid set documents.
    3. Include text “Record Drawing” or “As Built” on all sheets.
    4. Include all revision deltas and clouds on all sheets.

5. AutoCAD files shall adhere to the following standards:
    a. Full drawing package in AutoCAD (AutoCAD 2020 or most current version), executable .dwg format
    b. Include all fonts and plotting line-weights
    c. Include all cross references

D. The Contractor shall prepare and provide a complete Electronic Cable Book (PDF format), submitted on CD or electronically, as documentation. This cable book shall consist of the following with each section bookmarked within the PDF file:
    1. Title of project
    2. Index page detailing the sections
    3. Site plans (Record set redlined drawings on original full-size bid set plans, hard and soft copy)
    4. The drawings shall depict, at a minimum, the following conditions:
        a. Division 27 systems as applicable

E. Final inspection will not be made until drawings are received and approved. Record Drawings shall include “As-Built” one-line and wiring diagrams, with terminations identified, wire color coding schedule, pull box locations, and conduit routing plans.

F. Warranty certificates and documentation.
    1. One (1) Year workmanship warranty
    2. Limited Lifetime manufacturer warranty for Fiber Optic plant.
    3. Limited Lifetime manufacturer warranty for Cat6/Cat6A copper plant.

END OF SECTION 27 00 00

SECTION 27 05 00
COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 GENERAL

1.1 SCOPE

A. The work of this section consists of materials and methods for all information, communication, and technology pathways work installed under Division 27 and Division 28.

1.2 RELATED REQUIREMENTS

A. Division 01 00 00 specifications, General Requirements
B. Division 26 specification sections, as applicable
C. Division 27 specification sections, as applicable
D. Division 28 specification sections, as applicable

1.4 CODES AND STANDARDS

A. See specification section 27 00 00 for requirements

PART 2 PRODUCTS

2.1 GENERAL

A. All products used on this project shall bear the label and be approved by Underwriters Laboratories “UL” unless otherwise approved in writing by the Owner/Architect/Engineer.
B. Any modification that voids the equipment’s UL listing is strictly prohibited (i.e. relocated or oversize knock-outs).
C. Any modified new equipment that voids the UL listing shall be replaced by the Contactor (parts and labor) at their expense.
D. All products shall be new and unused and shall be of manufacturer's current and standard production.
E. Where two or more equipment items of the same kind are provided, all shall be identical and provided by the same manufacturer.
F. Drawings and specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory operation.
G. Product Availability:

    1. Contractor, prior to submitting a proposal, shall determine product availability and delivery time, and shall include such considerations into his proposed Contract Time.
    2. Certain products specified may only be available through factory authorized dealers and distributors. Contractor shall verify his ability to procure the products specified prior to submitting a proposal.
    3. Equipment shortages, COVID-19 recovery phase, all equipment and material shall be ordered upon Owner/Architect/Engineer and design professional approval of product submittals and contractor shop drawings. The contractor shall immediately notify the Owner/Architect/Engineer of any long lead or backordered items so an alternate substitution may be reviewed for approval prior to ordering.

2.2 RACEWAYS

A. Rigid Steel Metallic (GRC): Full weight with threaded fittings conforming to industry standards. Rigid steel conduit in contact with earth or in concrete slabs must be PVC wrapped.

   1. Rigid Steel Conduit: Protected inside and outside by galvanizing or sherardizing. By Triangle, Western Pipe & Tubing, Republic or approved equal. Risers and 90-degree elbows shall be wrapped with 3M Scotchwrap 51 PVC-based tape and 3M pipe primer (cover exposed threads and couplings).

B. Electric metallic tubing (EMT): Protected inside and outside by galvanizing or sherardizing. Minimum diameter size for EMT is ¾" and maximum diameter is 4". Same manufacturers as for rigid steel conduit. All fittings by: Thomas & Betts, Steel City, Raco, OZ/Gedney, or approved equal.
C. Flexible conduit: All Flex, American Flexible Conduit, or approved equal. Where exposed to weather use liquid-tight flexible conduit, type UA complete with waterproof fittings. American Flexible Conduit, Electri-Flex, Sealtite, Anaconda, or approved equal.
D. PVC conduit: Schedule 40 polyvinyl chloride high density, high impact, type two with factory-made bends, couplings and fittings, as manufactured by Carlon, PW Pipe, Cantex, or approved equal. Use of PVC is subject to local utility company having jurisdiction.
E. Raceway Fittings:

   1. Rigid Steel Conduit (GRC): Fittings, such as couplings, connectors, conduit bodies, elbows, bends, etc., shall be subject to same requirements as for rigid steel conduit. Couplings and unions shall be threaded type, assembled with anti-corrosion, conductive anti-seize compound at joints, and made absolutely tight to exclude water. Unions shall be equal to Crouse-Hinds UNY, UNF or approved equal.
   2. EMT: Fittings for indoor use: couplings and connectors 3/4" and larger shall be steel setscrew type or threaded compression type. 3/4" and larger, and all outdoor applications shall be compression type. All connectors must have insulated throats.
   3. Flexible Metallic Conduit: Angle wedge type with insulated throat.
   4. Bushings: Metallic insulated type. Weatherproof, liquid-tight, dust-tight installations with sealing ring and insulated throat, Crouse-Hinds, OZ/Gedney type "KR".
   5. Expansion and Deflection Fittings: OZ/Gedney, Type "DX" or accepted equal.

F. All multi-channel non-metallic surface mounted raceways shall be three compartment 5500 Wiremold by Legrand or approved equal - color to be ivory or as selected by the Owner/Architect/Engineer. Provide all components necessary to complete the work. See Appendix A for additional information.

   1. 5500WC- Wire Clip to be installed every 24"

G. All small single or dual channel non-metallic surface mounted raceways shall be 2300 Wiremold by Legrand, type and size specified in the drawings or approved equal - color to be ivory or as selected by the Owner/Architect/Engineer. Provide all components necessary to complete the work.

   1. Components include, but are not limited to:

      a. Base
      b. Cover
      c. Surface mount box
      d. Tee fitting
      e. 90 flat elbow, inside, outside fittings
      f. Entrance End Fitting
      g. Blank End Fitting

h. Transition Fitting
i. Cross-over Fitting
j. Wire Clip to be installed every 24”

2.3 BOXES

A. Galvanized one-piece or welded pressed steel type. Boxes for fixture shall not be less than 4" square and shall be equipped with fixture stud. Boxes shall be at least 2-1/8” deep, 4" square for 1 or 2 gang devices, with plaster rings and gang box with gang cover. Boxes mounted in wall or ceiling finished with gypsum board shall be furnished with plaster rings. Use screws and not nails to support outlet boxes. Boxes in unfinished areas, installed exposed, shall be cast metal type for switches and convenience outlets. Provide blank cover for all boxes without fixture or device.
B. Interior Junction boxes, larger than 8” square, located indoors shall be NEMA rated, with hinged door and an Allen key type lock kit.
C. Exterior Junction boxes, larger than 8” square, located outdoors, or in wet or damp locations shall be rated NEMA-3R, with hinged door and cylinder lock kit keyed to match the site’s master key.
D. Floor boxes shall be one-gang or multi-gang recessed, fully adjustable with lids and cover plates for respective tile or carpet floor finish. For "hard" floors such as tile or wood, the top of the cover shall be flush with the top of the finished floor. Receptacle covers shall have individual flip-lids with screw lock. Junction boxes shall have screwed on plugs.

    1. Grade level or below: Watertight and concrete-tight of cast iron construction, FSR FL series, Walker 880CS series or equal.
    2. Above grade level: Concrete-tight of stamped steel construction, FSR FL series, Walker 880S series or equal.

E. Provide and install center pin Torx tamper-proof screws for all exterior boxes and conduit bodies (i.e. LB, SLB, RLB, etc.).

2.4 PULL LINE

A. Furnish and install pull line in all new unused (empty) raceways / conduits.
B. Furnish and install replacement pull lines in all raceways if new cables are pulled through them.
C. All pull lines shall be:

    1. Permanently tagged with identification at both ends.
    2. Minimum 1/8" diameter, or larger if so, designated on plans, braided line of polypropylene or Jet-Line #232, or approved equal line of continuous fiber polyolefin. Minimum breaking strength of 1/8 in. line: 200 lbs.

2.5 PRECAST CONCRETE GROUND BOXES/HANDHOLES

A. Ground boxes shall be size as indicated on the drawings. Design loads shall consist of live, dead, impact, hydrostatic and other loads. Live loads shall be for H-20 and/or H-20-S16-44, or as required, per A.A.S.H.O. standard specifications for highway bridges with revisions. Design loads shall be sixteen KIPS. Concrete shall be per ASTM-C-33-64. Lightweight concrete shall conform to ASTM-C-33-64T. Cement shall be Portland Cement meeting ASTM-C-150 Type II standards. Compressive strength shall be minimum 4,000 psi at 28 days.
B. Ground boxes shall be supplied with steel edging in order to make spot welding cover lid to enclosure an option.

C. Ground boxes (48" x 30" or larger): Pre-cast high-density reinforced concrete with end and side knockouts, pulling-in irons. Minimum 4" wall thickness conforming to utility standards with spring assist traffic rated lids. Coordinate size of thin-wall knockouts with manufacturer for conduit entry. Acceptable manufacturers shall be Old Castle, Christy, Jensen or equal.
D. Ground boxes (smaller than 48" X 30"): Pre-cast high-density reinforced concrete with end and side knockouts, and extension as required. Minimum 1-1/2" wall thickness. Acceptable manufacturers shall be Old Castle, Christy, Jensen or equal.
E. Ground Box Covers: Large ground box covers conforming to utility standards with spring assist traffic rated lids shall be spring assisted traffic rated one or multi piece as required, steel checker plate, galvanized with anti-slip surface rated for parkway loading, with hold-down bolts. All boxes shall use H-20 rated traffic covers. No concrete covers shall be allowed.

    1. All Ground Box Covers shall be factory marked “Signal” unless drawings for marking/label indicates otherwise. Covers shall be provided with Penta Head hold down bolts.

F. Utility ground boxes shall be per their requirements. Provide with ground rod as required.
G. All conduits terminating in ground boxes shall be evenly spaced, squarely cut, and bell ends installed.
H. All exterior conduits installed shall be color coded based on project standards. See project details.
I. All new ground boxes shall be located using GPS points (decimal degrees) and documented on the As-Built drawings.

2.6 PENETRATIONS AND SLEEVES

A. All penetrations through fire rated assemblies (walls, ceilings and floors) shall be made with materials and/or sleeves that meet or exceed the fire rating of the assembly.

    1. Approved products: Specified Technologies, Inc. EZ-Path series, sealants, putty and pads.

B. All penetration through non-rated partitions shall be made with conduit sleeves (see Raceway/EMT above) and sealed with draft stop material.

PART 3 EXECUTION

3.1 PATHWAYS AND RACEWAY

A. EMT conduit may be used at following locations:

    1. In dry in-wall spaces.
    2. In partitions other than concrete or solid masonry.
    3. In exterior locations, except as noted in 3.01.B.

B. Rigid steel conduit and fittings shall be used for vertical risers and on top of all roofs, overhangs, walkways and canopies.
C. All raceways installed in interior exposed locations shall be surface mounted raceway (Wiremold) by Legrand.
D. Provide flexible connections of short length (4 foot maximum) to equipment subject to vibration or movement and to all motors. Provide a separate bonding conductor in all flexible connections, except as provided for in CEC 250-91 (b) Ex1.
E. Portable buildings shall have weather-proof flex transition from underground to building conduits for both high/low voltage systems.

F. Install exposed conduit run neatly, parallel to or at right angles to structural members. Maintain a minimum of 12 inches of clearance from steam or hot water pipes. All installed unistrut / strut channel supports should allow for future conduit attachments. The width of unistrut / strut channel to match the width of the closest attached junction box. See drawing details for attachment requirements.
G. Supports: Support conduit with two-hole straps or unistrut / strut channel where shown and/or specified. Coordinate supports with architectural details. Secure to wood structure by means of bolts or lag screws, to metal by means of shallow self-tapping screws, to concrete by means of insert or expansion bolts, to brickwork by means of expansion bolts, and to hollow masonry or stucco by means of toggle bolts. Straps, expanders and shields shall be steel or malleable iron.
H. Spacing for all EMT and rigid steel conduit supports shall be as follows unless otherwise specified in drawing details:

1. Surface conduits, roof mounted:

   a. Spacing of supports shall comply with CEC Article 344, Table 344-30(B)(2) and 2019 CBC 1603A.
   b. Construction of roof supports shall comply with roofing manufacturer's requirements.
   c. Roof supports shall be securely fastened to the roof with a gluing system approved by the roof manufacturer.
   d. Route conduits parallel with mechanical piping and along building lines.
   e. Provide ground wire in conduits.

2. Surface conduit spacing and supports and unless otherwise specified or shown on drawing details:

   a. EMT – Size 3/4” to 1-1/2” – 4’ maximum spacing (3 each supports per 10’ conduit length) and 12” from each end of conduit at coupling, connector or 90-degree bend.
   b. EMT – Size 2” to 4” – 4’ maximum spacing (3 each supports per 10’ conduit length) and 12” from end of conduit at coupling, connector or 90-degree bend.
   c. Rigid steel – Size 3/4” to 1” – 4’ maximum spacing (3 each supports per 10’ conduit length) and 12” from each end of conduit at coupling, connector or 90-degree bend.
   d. Rigid steel – Size 1-1/2” to 2” – 10’ maximum spacing (1 each supports per 10’ conduit length) and 12” from end of conduit at coupling, connector or 90-degree bend.
   e. Rigid steel – Size 3” to 6” – 10’ maximum spacing (1 each support per 10’ conduit length) and 12” from end of conduit at coupling, connector or 90-degree bend.

I. Do not install conduit in the “section” of concrete slabs, except for perpendicular penetrations. Refer to Structural Drawings for specific details.
J. Conduits installed in contact with concrete or earth shall be:

1. Install PVC conduit in a 3” sand or fine earth (passed through 1/8 in. screen) envelope below ground. Provide a minimum of 3” of sand or fine earth at the bottom of the trench before laying conduits.
2. Risers, sweeps, bends greater than 30 degrees, shall be PVC-wrapped, or rigid steel conduit with a minimum inside bend radius as follows unless otherwise specified:

Conduit Size (Inches - Nominal)	Minimum Bending Radius (Times conduit size)
2" and smaller	6” Inch
2” – 4”	24” Inch

3. When installing underground conduits to specified depth, depth shall be taken from the top of the conduit to the finished grade level. Unless otherwise specified, underground conduits shall be installed

with top side not less than 24" below finished grade except that utility company primary conduit shall be 30" minimum below finished grade or as required to meet utility company standards. All conduits inside foundation line shall be not less than 2" below sub grade.

4. The minimum size of conduits outside the foundation line shall be 1", 3/4" inside the foundation line.
5. Place two 3" wide fluorescent orange non-biodegradable plastic tapes on both sides of trench at 12" below grade, labeled "CAUTION FIBER OPTIC LINE BURIED BELOW". Tape shall be continuous for full length of trench.
6. Contractor shall install a #10 insulated wire at the same depth as the underground conduits. The #10 insulated wire shall be continuous for full length of trench and terminated on unistrut / strut channel at the riser or grounding strip at ground box.

K. Above ground conduits shall have a minimum inside bend radius as follows unless otherwise specified:

Conduit Size (Inches - Nominal)	Minimum Bending Radius (Times conduit size)
2" and smaller	6” Inch
2” – 4”	24” Inch

L. If conduit is designated for low voltage use, no more than a total of 270 (3 ea. 90-degree bends, max.) degrees of conduit bend radius will be allowed between boxes.
M. All junction boxes shall be connected to conduits using appropriate connecting hardware (i.e. box connectors)
N. The use of conduit body LB, SLB or LBT fittings for information, communication, and technology systems is strictly prohibited.
O. Clean, prepare, and paint all exposed conduit, junction boxes, unistrut, fittings and accessories except rooftop mounted rigid steel conduit to match the surface in which it is installed.

3.2 EXPANSION JOINTS

A. Provide conduit expansion fitting in each conduit run, which is mechanically attached to separate structures to relieve strain caused by shift of one structure in relation to another.
B. Provide conduit expansion fitting in each conduit run wherever it crosses expansion joint in structure to which it is attached.
C. Provide expansion fittings where expansion and contraction are a consideration in long runs of exposed conduits (one inch [1"] or larger conduit in excess of one hundred feet [100']).

3.3 PROOFING

A. Before pulling any conductors into a PVC conduit, the conduit shall be first be proofed by pulling through a mandrel of a diameter ¼ in. smaller than the conduit inside dia., followed by a swab of the same diameter as the conduit inside diameter. Proofing will be done in the presence of Construction Manager for verification.

3.4 SURFACE MOUNTED RACEWAYS

A. Surface mount non-metallic raceways shall be used as required to provide communications cabling services as shown on installation drawings.

B. The Contractor will provide and install all surface mounted non-metallic type raceway and appropriate fittings to provide a safe and complete installation. All installation must meet manufacturers recommended installation procedures.
C. All non-metallic raceway boxes, bases, covers and fittings shall be of the same manufacture.
D. Wire management clips shall be installed in all raceways (vertical and horizontal runs) on maximum of 24” on center spacing. If utilizing existing raceway for new wires, wire management clips shall be installed.
E. The non-metallic raceway components shall meet all of the CEC applicable articles.
F. Multiple channel surface mounted raceways shall be color-coded and marked with a permanent marker on the inside of the channel and across the entire length of the channel blue for data, telephone, and IPTV and red for power. These color-coded channels shall be installed consistently with the same relative position of color on the top and the bottom throughout the site in accordance with CEC Article 352-26.
G. The non-metallic raceway may have a factory-applied adhesive for mounting to the substrate. The contractor shall not use the factory-applied adhesive, instead the Contractor shall fasten raceways every 16" on center to studs wherever possible utilizing appropriate fastening methods by the manufacturer. The contractor shall use pan head type screws, sized in accordance with the manufacturer installation instructions. In addition to the manufactures mounting instructions, mounting hardware and anchor types recommended for any raceway that shall be mounted to the building or structure.

    1. Sheet rock / drywall / wall board: by means of Easy Anchor, toggle bolt, other spread type anchor with load distribution, or approved equal.
    2. Concrete / cinder block / solid masonry: by means of expanding compression type lag, expanding compression type bolt, expanding compression type all tread with nuts, or approved equal.
    3. Tile / Stucco / hollow masonry: by means of toggle bolts or approved equal.
    4. Wood: by means of lags, pan head wood screws, or approved equal.
    5. Metal: by means of a clamp, self-tapping pan head screw, or approved equal.

H. The raceway is to be manufactured of rigid PVC compounds. The cover shall have a matte texture.
I. A full complement of fittings must be available including, but not limited to, extension boxes, 90-degree elbows, tees, inside corners, outside corners, fixture boxes, wire clips, and device boxes. All fittings must match the color of the raceway cover.
J. The raceway and all system components must be UL Listed and exhibit non-flammable self-extinguishing characteristics.
K. At locations where raceway is mounted below 48 inches from the finished floor the contractor shall install a device bracket every 30” on center throughout the entire length of the raceway system. Any unused slots on the device bracket shall have a blank plate installed.
L. Do not use pulling means, including fish tape, cable or rope, which can damage the non-metallic surface raceway.
M. Raceway shall not have covers installed until fastening and cabling is approved by the inspector of record.

3.5 POWER AND COMMUNICATION POLE

A. In areas with system furniture and/or office furniture is set up in open areas, the cables shall be routed through an existing power pole, or a contractor supplied and installed power pole from the ceiling space to the floor.
B. Power pole shall be properly anchored to the ceiling and the floor using the recommended mounting instruction from the manufacture.
C. Contractor may utilize an existing power pole provided fill capacities are not exceeded.
D. Project manager or Owner/Architect/Engineer representative shall determine how system furniture areas will need to be fitted with a power pole device.
E. In the event that a power pole is not in place to serve the specific systems furniture area, the contractor is required to provide and install one.
F. Contractor shall obtain clarification if method of installation is unclear regarding how a power pole will be installed prior to submission of contractor's bid.
G. Where cables pass through a hole in the pole, the contractor shall provide and install a grommet around the hole in the power pole to protect the wire and cable. The grommet will be fitted with either a plastic or rubber shutter device that provides a tight seal around the wire and cable. In addition, the contractor shall provide and install a spiral wrap type plastic device, which shall serve as a protected raceway from the power pole to the system furniture. The contractor shall then route the cables into the systems furniture raceways to the designated point of attachment at each drop location.
H. The contractor will terminate the wire and/or cable on the device outlets, which will be installed in the appropriate manner for the type of furniture being installed.

3.6 FLOOR MONUMENTS

A. Contractor shall provide and install approved floor monuments in those areas that cables are routed below the floor space and or require termination of a drop outlet in an open area that cannot be served either by a fixed wall or power pole.
B. Contractor shall provide all necessary labor and materials to saw cut floor, core holes and patch substrates/surfaces necessary to accommodate the installation of a floor monument.
C. Contractor shall provide and install a floor monument as specified in construction documents.
D. Where cables pass through a hole in the monument, the contractor shall provide and install a grommet around the hole in the power pole to protect the wire and cable. The grommet will be fitted with either a plastic or rubber shutter device that provides a tight seal around the wire and cable. In addition, the contractor shall provide and install a spiral wrap type plastic device, which shall serve as a protected raceway from the monument to the system furniture. The contractor shall then route the cables into the systems furniture raceways to the designated point of attachment at each drop location.
E. The contractor shall then route the cables into the systems furniture raceways and/or office furniture setup in open areas to the designated point of attachment at each drop location. The contractor will then terminate these cables on device outlets which will then be installed in a high-profile box, which will be surface mounted to the underside of the work surface at each location.

3.7 EXCAVATING, BACKFILLING AND COMPACTING FOR UTILITIES

A. Excavating, backfilling and compacting for conduit, underground pull boxes, vaults and other underground electrical and low voltage utilities shall be performed in accordance with Specification Section 31 00 00 (Earthwork) for Utilities and the Geotechnical Engineering Consultant.

3.8 CONDUIT CAPPING

A. Cap conduits during construction with manufactured seals. Swab out conduits before wires are pulled in.

B. Cap all empty conduits below grade and in pull boxes with manufacturer's caps to prevent entrance of debris, attach pull string to cap.

3.9 CONDUIT PENETRATIONS

A. Penetrations through walls, ceilings, or floors.

1. Wood, stucco, drywall, and hallow masonry

a. Scanning for structural members and wall studs:
   i. Contractor shall scan the wall for studs and metal using an electronic stud finder to avoid drilling through a structural member.
   ii. If the contractor is unsure of the building's structural supports, the contractor shall notify the inspector of record and/or project manager to confirm the location before drilling.

b. Drilling

   i. A pilot hole not exceeding 3/8" diameter shall be drilled through the material for each penetration to confirm placement of penetration on both sides of the wall and before using an auger bit or hole saw to finalize penetration size.
   ii. Final penetration sizes shall take into account the size of the conduit to be installed including box connectors if EMT and angular space requirements for fire or draft stopping.

2. Concrete, brick, and solid masonry

a. X-ray scanning
   i. Contractor shall perform or hire out to have each location of each wall penetration x-rayed to confirm the locations of rebar and other structural steel supports.
   ii. If the contractor is unsure of the building's structural supports, the contractor shall notify the inspector and/or project manager to confirm the location before drilling.

b. Core boring/ Drilling

   i. Contractor shall notify the inspector and/or project manager of the time the core boring/drilling will be performed.
   ii. The contractor shall save all removed material from wall for inspection. Contractor shall take precautions to protect site property from water and debris created by core boring.
   iii. Final penetration sizes shall take into account the size of the conduit to be installed including box connectors if EMT and angular space requirements for dry packing.

c. Filling angular space / dry packing

   i. Contractor shall fill the angular space between the conduit and the wall with structural grout. The grout shall be even and uniform all the way around the conduit with no gaps or voids.

B. Where conduit passes through walls, ceilings, or floors with connection points to junction boxes or raceway mounted to the same wall as the penetration provide rigid steel or IMC conduit treaded on both ends and secured in place with locking rings on both sides. Bend radius requirements shall be maintained where penetrations are made through the back of raceways; junction boxes with adequate depth shall be installed in order to comply with this requirement.

C. Where conduit passes through walls, ceilings, or floors with connection points to junction boxes or raceway not mounted to the same wall as the penetration provide EMT conduit and secured in place with unistrut / strut channel. Box connectors shall always be used to connect EMT to junction boxes and raceways.

D. Where conduit passes through walls, ceilings, or floors with no connection points to junction boxes or raceway provide rigid steel or IMC conduit treaded on both ends and secured in place with locking rings and large reducing washers on both sides.
E. Where conduit passes through finished walls or ceilings, provide steel escutcheon plates, chrome or painted, as directed. Conduit, which penetrate floor slabs, concrete or masonry walls shall be grouted and sealed watertight at penetrations.
F. Fire stopping:

    1. Seal all conduit penetrations through fire rated walls and floors fire and smoke tight in conformance with 2022 CBC Sections 714 & 2022 CEC 300-21.

G. Draft stopping:

    1. All non-fire rated walls must be draft stopped and sealed. Submit method to be used for approval by inspector and/or project manager. Mineral wool is one product that may be used.

H. Water stopping:

    1. All exterior penetrations shall be sealed watertight. The contractor shall use silicon rubber caulk or other approved methods and materials. Submit method and material with inspector and/or project manager.

I. Provide 12" vertical and horizontal clearance for conduit risers through roofs. Coordinate with roof manufacturer to seal roof.

3.10 DEMOLITION

A. Any existing equipment and cable noted to be removed on design plans or abandoned devices and conduit not being reused by this project shall be removed by the Contractor.
B. Removed equipment shall be inventoried and turned over to the Owner/Architect/Engineer or disposed of per the project's instructions.
C. Disturbed surfaces shall be repaired to match original surface condition and prepped for painting.
D. Blank electrical plates colored or painted to match existing surfaces shall be installed over abandoned flush mounted device boxes.

3.11 BOXES

A. Screws shall be used to attach boxes, and must be accurately placed for finish, independently and securely supported by adequate wood backing or by manufactured adjustable channel type heavy-duty box hangers. Boxes with metal box hangers shall be attached to metal studs. Box hangers shall be securely tied or welded (where permitted) to metal studs. Paint weld with rust inhibitor. Boxes installed in masonry tile or concrete block construction shall be secured with auxiliary plates, bars or clips and be grouted in place.
B. Locate outlets at the following heights above floor to the center of the device or handle unless otherwise noted on Drawings, Specifications, 2022 CBC 11B-308 or as required to meet ADA handicap requirements.

    1. Convenience Outlets: 18" AFF (6" above counter or splash not to exceed 40" above finished floor).
    2. Telephone Outlets: 18" AFF (45 in. for wall phone).

C. Install pull boxes as required in accessible spaces but do not install in finished areas unless approved by the Owner/Architect/Engineer.

D. Outlet boxes on opposite sides of wall requiring protected openings shall be separated by a horizontal distance of twenty-four (24") inches, Title 24 Part 2, 713.3.2 Exception #1.
E. For sound control, separate outlets on opposite sides of walls 16" minimum. Where outlets are less than 16" or in sound rated walls, seal airtight with fire rated sheet putty pads. Fill gap between junction box and wall with acoustical sealant all around perimeter of junction box. Fill conduits larger than 1 1/4" with fire rated putty.
F. Installation of conduit and outlet boxes in fire-resistive walls and partitions shall comply with Title 24, Part 2, Section 713.
G. Installation of conduit and outlet boxes in fire-resistive floors, floor-ceiling or roof-ceiling assemblies shall comply with Title 24, Part 2, Section 713.

3.12 GROUNDING AND BONDING

A. Ground fittings shall be UL approved for each application as installed, installed and connected to system in accordance with 2022 CEC Code requirements.
B. Neutral conductors and non-current carrying parts of equipment at each installation shall be grounded in accordance with applicable code. Ground conductor shall be copper having a current capacity in accordance with CEC Section 250.
C. All equipment cases, motor frames, etc. shall be completely grounded to satisfy requirements of CEC. Install bond wire in flexible conduit. Install copper bond wire, sized in accordance with CEC, in all nonmetallic raceways and bond to all metallic parts using approved fittings.
D. Service ground conductor shall be connected to a "Ufer" encased ground and bonded to the cold-water pipe system.
E. Ground resistance of made electrodes shall not exceed 25 ohms, per CEC Article 250-84. Perform ground resistance test prior to connection.
F. All connections shall be made with solder less connectors or molded fusion-welding process. Solder less connections shall be made to conform to Code requirements or manufacturers requirements if more stringent.
G. Provide ground wire in all rooftop conduits.

3.13 FIELD TESTING

A. General: Perform field test in the presence of the Owner's Representative except as otherwise specified. Provide required labor, materials, equipment and connections to perform tests. Document results and submit them to the Owner's Representative. Repair or replace all defective work.
B. Perform Megger test on all grounding legs:

    1. Notify the Owner/Architect/Engineer when installed cable is ready to be tested.
    2. Apply Megger tests. Supply labor, materials and test equipment required to perform continuity checks and Megger tests. Submit test data for approval.
    3. If any failure is detected, locate failure, determine cause and, as directed by the Owner/Architect/Engineer, replace or repair cable or conductor to satisfaction of the Owner/Architect/Engineer at no increase in Contract Sum.
    4. Subject feeder cables rated 600 volts AC to one (1) minute withstand test, or until stable reading is obtained with 1000-volt Megger. Provide written report of Megger test results. Test report to include all test conditions.
    5. Do not Megger test any cables after connecting test equipment, unless specifically directed to do so by the Owner/Architect/Engineer.

3.14 CLEANING, PATCHING, AND PAINTING

A. Brush and clean work prior to concealing, painting and acceptance. Performed in stages if directed.
B. Clean and repair soiled or damaged painted exposed work and match adjoining work before final acceptance.
C. Remove debris from inside and outside of material, equipment and structures.
D. All conduit, connectors, j-boxes, and accessories shall be painted white with primer.
E. All mud-rings shall be color code painted for inspection.

3.15 CABLING INSTALLATION AND DISTRIBUTION

A. Cable shall be routed in appropriate conduit by system type as outlined in details. Contractor is to contact Owner/Architect/Engineer representative when this requirement can’t be met.

B. Cable shall not be exposed at any point in the cable path. Contractor is to use appropriate pathway for the situation (i.e. above drop ceiling, inside wall, conduit, or non-metallic surface raceway).
C. Cables shall be protected and sleeved with a conduit in locations where cables need to pass through walls, floors, or hard ceilings. Contractor shall install rigid steel or IMC conduit threaded on both ends and secured in place with locking rings and large reducing washers on both sides. Bend radius requirements shall be maintained where penetrations are made through the back of raceways; junction boxes with adequate depth shall be installed in order to comply with this requirement. The fire rating of the wall must be maintained during and after installation.
D. At solid wall locations such as plaster, brick, concrete, cinder block, tile, reinforced concrete, Contractor will provide and install surface mounted non-metallic raceways or equivalent. The use of different series raceways is required at locations where cable fill capacities are exceeded.

E. Cables will be run vertically inside the wall and into the ceiling space. Terminations on stud walls will be accomplished with cut-in type electrical boxes with a 1” conduit (flex or EMT) extended from the box within the wall to ceiling access space.
F. Cables routed above drop ceilings shall be run in corridors wherever possible in order to avoid furniture and work areas so that access to the cables is unencumbered.
G. The cables are to be as accessible as possible, placed above all other items in the ceiling, including ducts and supports.
H. Service loops:

1. Service loops in Ground boxes and J-boxes shall not be installed unless with prior written approval or to allow for the minimum bend radius specified by the manufacturer:
2. Cables routed above drop ceilings shall be run in corridors wherever possible in order to avoid furniture and work areas so that access to the cables is unencumbered.
3. Fiber feeder cable:

    a. Shall be a minimum of 10’ at all MDF and IDF locations.
    b. Shall be routed around the perimeter of the ground box as cable exits and enters each side of the ground box. No visible service loop required. Cable shall be secured to the side of the ground box and not rest on the bottom of the box.

4. Voice feeder cables:

    a. Shall be routed around the perimeter of the backboard in which it is terminated on.
    b. Shall be routed around the perimeter of the ground box as cable exits and enters each side of the ground box. No visible service loop required. Cable shall be secured to the side of the ground box and not rest on the bottom of the box.

5. Category 6/6A cable:

    a. Shall be a minimum of 6’ at all MDF and IDF locations.
    b. Shall be routed around the perimeter of the ground box as cable exits and enters each side of the ground box. No visible service loop required. Cable shall be secured to the side of the ground box and not rest on the bottom of the box.
    c. Shall be a minimum of 9” behind each station location.

6. Service loops, Intercom:

    a. Horizontal cables:

i. Shall be a minimum of 3’ at all head end termination locations.
ii. Shall be a minimum of 12” behind each speaker.
iii. Feeder/Backbone cables shall be routed around the perimeter of the backboard in which it is terminated on.

A. The cables are to be as accessible as possible, placed above all other items in the ceiling, including ducts and supports.
B. Do not use pulling means, including fish tape, cable or rope, which can damage the non-metallic surface raceway.
C. Use pulling compound or lubricant, with prior Owner/Architect/Engineer approval, only when necessary.
D. Pulling compound shall be a water base pulling lubricant that will not deteriorate cable or conduit.
E. Cables shall not be pulled across sharp edges. If sharp edges are present a small sleeve, insulating insert, or grommet shall be installed to protect the cable.
F. Cables shall be pulled free of sharp bends or kinks.
G. Cables shall not be forced or jammed between metal parts, assemblies, etc.
H. Cables shall not be pulled across access doors and pull box covers. Access to all equipment and systems shall be maintained.
I. Manufacturer's specifications for pulling stress and minimum bend radius shall not be exceeded on any cable.
J. Install or replace pull-string after installing cable in any EMT, IMC, Rigid, or PVC conduits.
K. A maximum fill capacity of 40% will be deemed acceptable for conduits and 75% of raceway and surface pathway. Contractor shall inform Owner/Architect/Engineer / Owner/Architect/Engineer representative in writing if this requirement cannot be met. If the Contractor fails to inform the Owner/Architect/Engineer or its representative, any labor involve in rerouting cables in such conduit or raceways shall be the sole responsibility of the Contractor
L. Cable shall be identified with a machine-printed tag identifying the system type, source or head end location, and destination location in all access points (i.e. junction boxes, ground boxes, MDF, IDFs, etc.) and as they enter or exit the conduit pathway.
M. Contractor will assess whether or not the ceiling space is a plenum air return, which shall dictate the use of the listed plenum type or PVC type cable required in the materials specification section. Any cable installations that shall be pulled through underground conduit will require Outside Plant (OSP) cable. OSP cable are limited to a length of 50’ inside a building.
N. Power feeds of greater than 220 volts shall not be run parallel to UTP, Speaker or other system cables. Parallel runs of greater than 20 feet require a minimum separation distance of 3 feet, or 18 inches if cables are contained in a metallic conduit, which is grounded.
O. All power feeds crossing the path of UTP, Speaker or other system cables at right angles shall be a minimum of 6 inches in distance from the UTP cables.
P. There shall be a 6-inch separation between the cables and the light fixtures and motors. Contractor will notify the Owner/Architect/Engineer or it’s representative in the event this requirement cannot be met.
Q. All cable/cabling shall be kept 6 inches away from any heat source, i.e., HVAC ducting, steam valves, etc.
R. Fiber Optic cable/cables shall be identified with a tag identifying cable type, destination and origin, and date installed, every 30 feet when installed in open trays or suspension systems in ceilings.
S. Station Cable (UTP) or (STP) runs are not to exceed 290 feet.
T. Cable splicing at any point of any cable installed by the contractor is unacceptable without specific Owner/Architect/Engineer and designer approval.
U. No cabling is allowed to rest on any ceiling tile or suspension system unless specifically authorized by the Owner/Architect/Engineer. Strapping or mounting to any existing wires (e.g., lighting, ceiling grid, conduits, etc.) is not permitted.
V. Cables, regardless of classification, shall not be bundled in larger quantities than 24.
W. Cables bundled in quantities of 24 or larger shall be securely mounted to building structure (i.e. stud,

beam, or other framing member.) with Contractor supplied cable tray unless otherwise specified on design drawings and details.

X. Cables bundled in quantities less than 24 shall be securely mounted to building structure (i.e. stud, beam, or other framing member.) with Contractor supplied J-hooks every 4 feet unless otherwise specified on design drawings and details.

Y. Cables bundled in junction boxes shall be neatly routed and secured to box with Contractor supplied Velcro straps typically 4 per box.

Z. Cables shall be securely supported to building structure (i.e. stud, beam, or other framing member.) within 12 inches of any conduit or raceway entrance or exit. Cable tray may be required if not noted on plans.

AA. Contractor will place all UTP, Speaker and other system cables in the ceiling area on Contractor supplied and installed wire hangers or in floor spaces and raceways. Cable tray may be required if noted on plans.

BB. Insulation shall be removed to expose shielding and conductors/fibers to the exact length required by manufacturer for proper termination of plugs, pins and fiber terminations.

1. Wires and shielding shall not be nicked or damaged in any way upon termination of pins and closure of plug assembly.
2. Pins and plugs, upon termination, shall not be damaged in any way.

END OF SECTION 27 05 00

SECTION 27 11 00
COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 GENERAL

1.1 SUMMARY

A. The work detailed under this section contains the providing of all necessary labor, supervision, materials, equipment, testing and services to install all required components to provide a comprehensive equipment room and / or equipment enclosure, including complete cable ladder system or cable tray, cable basket system. Cable ladder, cable tray, and cable baskets will be used for cable management inside the equipment rooms, server rooms, and above accessible ceilings. Contractor shall regulate product availability and delivery time and shall include such considerations into his proposal Contract Time. Equipment rooms are defined as data MPOE or EF, MDF or ER / IDF or TR, and other communication head end equipment.

1.2 SCOPE

A. The work will include but not be limited to the following objectives:

1. For existing construction – provide, coordinate, and install all components and accessories as specified in the design documents to modify the existing system while maintaining compliance and to seamlessly integrate the new components into the existing campus' system.
2. For new construction – provide, coordinate, and install all required components and accessories as specified in the design documents for a complete and operable system.
3. Quality installation and finish workmanship is a high priority for the Owner/Architect/Engineer and the Contractor shall be held to a high-level of professional workmanship. Contractors unfamiliar with the Owner/Architect/Engineer's standards shall familiarize themselves with the Owner/Architect/Engineer's standards and requirements prior to beginning work
4. Labor and Materials: The Contractor shall provide and pay for all labor, materials, equipment, tools, utilities, construction equipment and machinery, transportation and other facilities and services necessary for the proper execution, operation and completion of the scope of work.
5. Contractor shall furnish and install all new components and hardware (active or passive) as indicated on the project drawings and/or as required to provide a turn-key system to the Owner/Architect/Engineer.
6. Contractor shall provide and install all required fire-treated 3/4" plywood on all walls of the equipment room.
7. Contractor shall coordinate and arrange to have all required electrical installed and placed as shown on project drawings and / or where required following best practices.
8. Contractor shall coordinate with all trades for all wall mounted equipment, junction boxes and/or or raceway required in the equipment room and provide actual elevations of all components on the required approved to-scale pre-installation shop drawings in order to eliminate any conflicts or clearance issues.
9. Contractor shall coordinate with all trades for all floor mounted equipment and provide actual floor elevations of all components on the required approved to-scale pre-installation shop drawings in order to eliminate any conflicts or clearance issues.
10. Contractor shall provide and install all required installed racks and cabinets.
11. Contractor shall provide a ground bus bar at each MPOE, MDF, IDF room and connect to proper building grounding system.
12. Contractor to provide all components to furnish complete cable ladder systems. Cable ladder

systems are defined to include, but are not limited to straight sections of ladder, type cable ladders, bends, tees, elbows, drop-outs, supports and accessories.

13. Contractor to provide all components to furnish complete tray systems. Tray systems are defined to include, but not limited to straight sections of tray, factory and field bends.”T” fittings, drop-out fittings, supports and accessories.
14. Contractor shall set up a complete wire management system at each MDF/IDF, this includes wire management organizer(s).
15. If existing MDF or IDF is in an area where construction will generate dust, the entire rack or cabinet shall be protected from dust. Extra care shall be taken to provide ventilation of the rack / cabinet if it is covered to allow air to circulate through the rack / cabinet in order for the equipment not to overheat or encounter thermal warnings.
16. When required per design documents uninterruptable power supplies (UPS) are to be provided, installed and configured by the Contractor.

1.3 RELATED REQUIREMENTS

A. Division 01 00 00, General Requirements
B. Division 26 sections, as applicable
C. Division 27 sections, as applicable
D. Division 28 sections, as applicable

1.4 CODES AND STANDARDS

A. See specification section 27 00 00 for requirements

PART 2 PRODUCTS

2.1 GENERAL

A. All products shall be new, unused and without blemishes and shall be of manufacturer's current and standard production.
B. Contractor shall confirm all equipment part numbers with the Owner/Architect/Engineer prior to ordering equipment and updating submittals as required.
C. Drawings and Specifications indicate man system components, and may not show every connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory installation and operation.
D. Mounting hardware and anchors recommended by the manufacturer of any material that shall be mounted to the building or structure:
   1. Wood: lags, wood screws, or approved equal.
   2. Metal: clamp or approved equal.
   3. Sheet rock / drywall / wall board: Easy Anchor, toggle bolt, other spread type anchor with load distribution, or approved equal.
   4. Concrete / cinder block / solid masonry: expanding compression type lag, expanding compression type bolt, expanding compression type all tread with nuts, or approved equal.

E. Product Availability

   1. Prior to submitting a contractor work schedule, shall determine product availability and delivery time, and shall include such considerations into his schedule.

2.2 CONDUIT AND RACEWAY

A. Refer to Division 27 05 00 for conduit and raceway installation requirements.

2.3 PLYWOOD BACKBOARD

A. Plywood, fire-retardant treated, 3/4” by 48” by 96” inches (19 by 1220 by 2440 mm). Conform with requirements for plywood backing panels specified in Division 06 Section "Rough Carpentry."
B. Mask and protect fire rating stamp on each backboard section piece if backboard is to be painted.

2.4 4-POST NETWORK / SERVER RACK

A. Refer to Construction Drawings for specified manufacturer and model.

2.5 2-POST NETWORK RACK

A. Refer to Construction Drawings for specified manufacturer and model.

2.6 WALL MOUNT NETWORK RACK

A. Refer to Construction Drawings for specified manufacturer and model.

2.7 FLOOR MOUNT NETWORK RACK

A. Refer to Construction Drawings for specified manufacturer and model.

PART 3 EXECUTION

3.1 INSTALLATION

A. ENTRANCE FACILITIES

1. Contact communications service provider and arrange for installation of demarcation point, protected entrance terminals, and housing when so directed by service provider.
2. Install underground or aerial pathways complying with recommendations in TIA/EIA-569-A, "Entrance Facilities".

B. UNDERGROUND ENTRANCE PATHWAY

1. Install underground entrance pathway complying with Division 26.
2. Comply with NECA 1.
3. Comply with BICSI TDMM 14TH Edition for layout and installation of communications equipment rooms.
4. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

C. EQUIPMENT RACKS AND CABINETS

1. Backboards:
   a. Shall be installed behind the rack or cabinet if the cabinet is not able to be directly attached to two vertical wall studs.

b. Backboards shall be made of fire retardant or treated materials, squarely cut, routed and sanded edges, void free and painted, leaving the fire-retardant stamp unpainted. Edges shall be sealed with manufacturing fire retardant sealant.
c. Backboards made from particle or pressed board materials shall not be acceptable.
d. Backboards shall be a minimum 3/4” thick and large enough to secure it to two vertical wall studs.
e. Backboard shall be painted with white fire-retardant paint if it is installed in an occupied area. The “FIRE RATED” stamp shall be visible after painting.
f. Backboards shall be fastened with 1/4” lag bolt and washer, non-recessed, with maximum spacing of 18" into 2 vertical studs. Backboards mounted on the inside of the cabinets shall be squarely cut, with sanded edges and void free. Inside backboard shall match the inside dimensions of the installed cabinet.

2. All data & voice communications racks and cabinets shall be anchored in accordance with manufacturer specifications, project specifications and/or drawn details, to walls and floors and grounded to building ground grid (not to water pipes etc.).
3. All floor-mounted racks and cabinets shall have ladder racking from top of rack or cabinet to nearest wall as directed by drawn details.
4. Securely mount equipment cabinet and racks to the building structure. Proper supports (example: 3/8" lag screws and expansion anchors) shall be used. Proper quantity of supports will be utilized. Dry wall screws and other types of supports not specifically approved to support equipment are specifically prohibited. Submit mounting supports for approval before installation.
5. Equipment cabinet mounted on or against walls will have 36” inch clearance in front of deepest component.
6. MDF and all IDFs shall have one dedicated 220V/30A outlet and a shared dedicated circuit with 1 dedicated quad 120/20A outlet.
7. Patch Panels: Mount patch panels into the cabinet/rack in top-to-bottom fashion with the first patch panel (Fiber) mounted at the top of the “Active” equipment rack. Uniquely label each patch panel according to the numbering convention outlined in the construction documents. Each port will utilize color-coded jack identifiers.
8. Cable Management: Secure the cable bundle(s) to the rack strain relief and cable management behind the patch panels and cross connect block panels. Install horizontal cable management panels and brackets for routing and management of patch cables. Maintain TIA/EIA and BICSI standards on bundling, supporting and bend radius.
9. Surge Protected Outlet Strips: Mount surge protected outlet strips per Manufacturer’s directions. Refer to details on the construction documents for mounting location.
10. Contractor to place a large label to ID the rack or cabinet location. It shall be placed on the top left side of the rack or the cabinet, clearly visible from the floor. A label shall also be placed on each of the racks or cabinet’s patch panel on the top left side of the patch panel (i.e. IDF 1.2).
11. If more than one cabinet or rack is located in the MDF/IDF, they will be labeled in alphabetical order (A, B, C, etc.).

D. CABLING

1. Conduit/raceway fill shall not exceed 40% percent of interior cross-sectional area.
2. Neatly dress and tie all cabling.
3. UTP cabling shall conform to a 6-foot separation requirement from the main power panel, transformers, switchgear and/or starter motors adjacent to the MDF, IDF and termination locations.
4. Design, layout, size, and plan new cable runs as required.
5. All wire and cable passing thru metal work shall be sleeved by an approved grommet or bushing.

E. BONDING AND GROUNDING

1. Refer to Section 27 05 00 for GROUNDING AND BONDING requirements.
2. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
3. Comply with ANSI-J-STD-607-A.
4. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
5. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.
6. Retain subparagraph below if screened twisted-pair cables and coaxial cables are in communications equipment rooms.
7. Bond the shield of shielded cable to the grounding bus bar in communications rooms and spaces.

3.2 WARRANTY, TESTING, AND COMMISSIONING

A. Refer to Division 27 00 00 for requirements.

3.3 CONTRACTOR CLOSEOUT DOCUMENTS

A. Refer to Division 27 00 00 for requirements.

END OF SECTION 27 11 00

SECTION 27 13 00
COMMUNICATIONS BACKBONE CABLING

PART 1 GENERAL

1.01 SUMMARY

A. This section defines equipment, materials, accessories, installation, configuration and testing requirements for a complete Communications Backbone Cabling system. The system shall provide reliable high-performance data communication from the Main Distribution Frame (MDF) / Equipment Room (ER) to each Intermediate Distribution Frame (IDF) / Telecommunication Room (TR) or equipment control points requiring fiber optic cabling.

1.02 SCOPE

B. The work will include but not be limited to the following objectives:

1. For new construction – provide, coordinate, and install all required components and accessories as outlined in the design documents for a complete and operable system.
2. For existing construction – provide, coordinate, and install all components and accessories as outlined in the design documents to modify the existing system while maintaining compliance and to seamlessly integrate the new components into the existing campus' system.
3. Labor and Materials: The Contractor shall provide and pay for all labor, materials, equipment, tools, utilities, construction equipment and machinery, transportation and other facilities and services necessary for the proper execution, operation and completion of the scope of work.
4. The Contractor shall furnish and install all new conduit/raceway and wire as indicated on the project drawings and/or as required to provide a fully functional system to the Owner/Architect/Engineer.
5. The Contractor shall terminate all strands of fiber at each fiber enclosure. All cables shall be installed with a minimum 10' service loops at MDF / IDF locations. Fiber will be terminated using LC type connectors.
6. Service loops shall be secured to backboard or rear of cabinet using a pre-manufactured fiber optic wheel with Velcro straps.
7. If applicable, existing systems shall remain operable until new systems are accepted and approved by the Owner/Architect/Engineer.
8. Testing of fiber and connections to insure a complete and operable end-to-end data connection using ANSI/TIA 568-C and ANSI/TIA/526-7 testing guidelines for fiber.
9. Fiber installs shall carry Limited Lifetime warranty (see Division 27 05 00 for requirements)

1.03 RELATED REQUIREMENTS

A. Division 01 00 00 specifications, General Requirements
B. Division 26 specification sections, as applicable
C. Division 27 specification sections, as applicable
D. Division 28 specification sections, as applicable

1.04 CODES AND STANDARDS

A. See specification section 27 00 00 for requirements

PART 2 PRODUCTS

2.01 FIBER OPTIC AND NETWORK CABLING BACKBONE

A. All products shall be new and unused and shall be of manufacturer's current and standard production.
B. Contractor shall confirm all equipment part numbers with the Owner/Architect/Engineer prior to ordering equipment and updating submittals as required.
C. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory operation.

D. Product Availability

1. Prior to submitting a project bid, the contractor shall determine product availability, delivery time, and shall include such considerations into the base bid for the communications systems scope of work as defined in the construction documents.

2.02 FIBER OPTIC CABLE MANAGEMENT RING

A. Re-closable ring cable management device. Ring shall be 24” inches in diameter for Copper Multipair, OSP, or Armored cable, and 12” diameter for indoor fiber cable.
B. Ring shall be mounted on the backboard at the Outside Plant OSP fiber entrance.
C. Preferred Product:

1. Leviton 24” Velcro fiber spool, 48900-OFR
2. Leviton 12” Velcro fiber spool, 48900-IFR

2.03 CABLE AND WIRE

A. Provide all new wire and cable required to install systems as indicated on design documents.
B. Single-mode fiber optic cables shall be tight buffered laser optimized multi-mode (LOMM) 9/125 OS2, 12-strand minimum (cable shall not exceed a .30” diameter).
C. Multi-mode fiber optic cables shall be tight buffered laser optimized multi-mode (LOMM) 50/125 OM4, 12-strand minimum (cable shall not exceed a .30” diameter).
D. Fiber Optic connectors for fiber optic stands shall be industry standard LC type connectors.
E. MDF / ER rack mount fiber optic enclosures Light Interface Unit (LIU) shall be completely loaded with Ceramic ferrule Duplex LC cassettes unless listed otherwise in drawings and details or approved equal.
F. Furnish one (1)-meter LC to LC duplex cross over fiber patch cord for every two terminations at IDF / TR locations and one (2) meter LC to LC duplex cross over fiber patch cord for every two terminations at MDF / ER location. The patch cords shall have connectors with ceramic ferrules. All patch cords shall be packaged with a factory performance certification report.

2.04 COMMUNICATIONS ENCLOSURES, CONDUIT, AND PATHWAYS

A. See specification section 27 05 00 for requirements

2.05 COMMUNICATIONS CONNECTING CORDS

A. See specification section 27 16 00 for requirements

PART 3 EXECUTION

3.01 INSTALLATION

A. The cables will be routed to their respective Main Distribution Frame (MDF) or Intermediate Distribution Frame (IDF) utilizing the shortest path possible while maintaining right angles to the building structure.
B. Contractor is required to adhere to the parameters in this section whether or not existing equipment has been placed by Contractor and/or others.
C. Contractor will notify the Owner/Architect/Engineer if any of the requirements cannot be met prior to bid.

D. Fiber Optic, Network Cabling Backbone

1. The Owner/Architect/Engineer has standardized on materials that provide component quality and maintainability. Refer to the Appendix A at the end of this specification for pre-approved material.

2. Fiber Optics Cable Installation and Testing:

   a. Fiber cables shall be securely mounted to the fiber enclosure using zip ties in at least two locations around the jacket to prevent cable twisting and movement. In addition, the Kevlar or strength member shall be bolted, tied, or securely fastened to the enclosure.
   b. Fibers strands shall be neatly organized in the enclosure with individual bundled paths from each cable to the bulkheads in which they are mounted.
   c. Fiber strands shall be made to rest in their final position without tension or stress of any kind.
   d. Service loops shall be secured to backboard or rear of cabinet using a pre-manufactured fiber optic wheel with Velcro straps.
   e. All spare optical ports and connectors shall have a dust cap in place to protect from the environment.
   f. Contractor shall provide and install blanks in unused spaces of the fiber enclosure.

E. Fiber Optics Testing

1. All optical test equipment shall have current, traceable calibration certification.
2. If fiber is supplied to Contractor by the Owner/Architect/Engineer shall be tested before installation, while still on the shipping reel, using an optical time domain reflectometer (OTDR). The test results shall be compared to the manufacturers test results. A discrepancy of more than 1 dB on any fiber in either window indicates possible shipping damage, and the fiber shall be returned to the supplier. The test results shall be maintained in a file for future reference.
3. All fiber shall be tested after installation according to the Method A procedures described in ANST/TIA-568-C.
4. Power meter test equipment shall produce a machine generated test report containing the minimum of the following test information:
   a. Contractor’s Name
   b. Operator’s Name
   c. Customer’s location
   d. Closet Location
   e. Cable ID

f. Test Summary – i.e. Pass/Fail
g. Date and Time of test
h. Test Standard
i. Equipment serial numbers
j. Length in Feet
k. Test direction – i.e. MDF to IDF=A-B / IDF to MDF=B-A
l. Wavelength
m. Optical loss in dB
n. Optical loss limit
o. Reference setting
p. Reference setting date and time

5. In addition to power meter testing, OTDR testing is to be performed in any location where the fiber is not continuous, i.e. coupled LC connectors (soft splice), fusion splice, and mechanical splice. When testing with an OTDR the contractor shall utilize a test lead or launch cable a minimum of 100 meters in length and a trail test cable a minimum of 100 meters in length. The contractor shall set a marker at the start and end of the tested cable on each test result and the difference in loss between the two markers shall be noted on the test report. The results of these tests (printed OTDR result power meter attenuation results) shall be provided by the installer as documentation of the quality of installation and as a baseline for future troubleshooting. The results shall be compared to the pre-installation test results for significant changes.
6. The fiber optic cable shall comply with maximum individual fiber loss limits in accordance with ANSI/TIA-568-C.

F. Fiber Optics Labeling

1. Fiber termination locations shall be labeled to corresponding fiber strands pairs at the MDF / ER and IDF / TR.
2. The labeling scheme shall be submitted by the contractor for Owner/Architect/Engineer / Owner/Architect/Engineer representative approval prior to installation.
3. Contractor is expected to provide tags, straps, and adhesive labels. These tags, straps, and adhesive labels shall be of high quality that will endure over time.
4. Labeling:
   a. Handwritten labels are not acceptable.
   b. Cables shall be labeled approximately 12” inches back from the point where the cable enters the fiber enclosure with a cable label that identifies the origin and destination of the cable.
   c. Closet labeling: each connection shall be labeled denoting each strands number, origin and destination.
   d. The type (single-mode or multi-mode) of fiber optic cable used shall be clearly labeled on the fiber patch panel per drawn details.
   e. Color-coding shall conform to ANSI/TIA specifications.

G. Voice Copper Backbone

1. Terminations shall be T568B configuration unless otherwise specified.
2. Labeling:
   a. Handwritten labels are not acceptable.
   b. Wiring termination locations shall be labeled to corresponding pairs at the MDF / ER and IDF / TR.

c. Cables shall be labeled no more than 3” back from each end of the termination point with a cable label that matches the patch panel labeling.
d. The labeling shall be in a white background with black lettering.
e. Contractor will provide tags, straps, and adhesive labels. These tags, straps, and adhesive labels shall be of high quality that will endure over time.
f. Each pair shall have a unique label throughout the site. This would allow a cable management system to track each cable pair.
g. Closet labeling: 66-block or surface-mount quickport box shall be labeled with the destination MDF / ER or IDF / TR number, sequential feeder pair number only.

3.03 CABLE

A. Design, layout, size, and plan new cable runs as required.
B. All wire and cable passing thru metalwork shall be sleeved by an approved grommet or bushing.
C. Conduit/raceway fill shall not exceed 40 percent of interior cross-sectional area.
D. Identify all cables at terminations. Identification shall be made with an approved permanent label, machine generated 1/4” black letters on white tape (Brady or equal.)
E. Underground cable shall be rated for use.
F. Neatly dress and secure / strap all cabling.

3.04 WARRANTY, TESTING, AND COMMISSIONING

A. Refer to Division 27 00 00 for requirements.

3.05 CONTRACTOR CLOSEOUT DOCUMENTS AND TEST RESULTS

A. Refer to Division 27 00 00 for requirements.

END OF SECTION 27 13 00

SECTION 27 15 00
COMMUNICATIONS HORIZONTAL CABLING

PART 1 GENERAL

1.1 SUMMARY

A. This section defines equipment, materials, accessories, installation, configuration and testing requirements for a complete and operational Communications Horizontal Cabling system. The system shall provide reliable high-performance data communication from the Main Distribution Frame (MDF) / Equipment Room (ER), Intermediate Distribution Frame (IDF) / Telecommunication Room (TR) or equipment control points to area workstations and communications device locations.

1.2 SCOPE

B. The work will include but not be limited to the following objectives:

1. For new construction – provide, coordinate, and install all required components and accessories as outlined in the design documents for a complete and operable system.
2. For existing construction – provide, coordinate, and install all components and accessories as outlined in the design documents to modify the existing system while maintaining compliance and to seamlessly integrate the new components into the existing system.
3. Labor and Materials: The Contractor shall provide and pay for all labor, materials, equipment, tools, utilities, construction equipment and machinery, transportation and other facilities and services necessary for the proper execution, operation and completion of the scope of work.
4. The Contractor shall furnish and install all new conduit/raceway and wire as indicated on the project drawings and/or as required to provide a fully functional system to the Owner/Architect/Engineer.
5. The Contractor shall install new Category 6A (Cat 6A) data cabling, station outlets at locations as indicated on drawings. Terminations will be ANSI/TIA standard T568B wiring configuration into RJ45 workstation data jacks.
6. The Contractor shall set up a complete wire management system at each MDF / ER, IDF / TR, this includes wire management organizer(s). Contractor shall provide the following:

    a. One (1) vertical wire manager for each equipment rack to be installed (height to match equipment rack overall units)
    b. One (1) 1RU horizontal wire manager for each new Cat 6A patch panel
    c. One (1) 1RU horizontal wire manager for each switch to be installed

7. The Contractor is required to adhere to current industry standards when distributing and terminating cables:

    a. All Cat 6A cables shall be secured to the rear cable management bar that is included with each of the patch panels.
    b. At the rear of the patch panel, 50% of the cables shall enter the patch panel area from the right side and 50% of the cables enter from the left side. Cables shall be bundled in groups no larger than 25 cables. All bundled cabling shall be similar type per cable separation guidelines.

8. Prior to installation, If the length of the cable run appears to be exceeding 275’ from station outlet to patch panel, the Contractor shall review requirement with Engineer.

9. If applicable, existing systems shall remain operable until new systems are accepted and approved by the Owner/Architect/Engineer or its representative.
10. All Category 6A (Cat 6A) installations shall carry Limited Lifetime warranty (see Division 27 00 00 for requirements).

1.3 RELATED REQUIREMENTS

A. Division 01 00 00 specifications, General Requirements
B. Division 26 specification sections, as applicable
C. Division 27 specification sections, as applicable
D. Division 28 specification sections, as applicable

1.4 CODES AND STANDARDS

A. See specification section 27 00 00 for requirements

1.5 CONTRACTOR QUALIFICATIONS

A. See specification section 27 00 00 for requirements

PART 2 PRODUCTS

2.1 GENERAL

A. All products shall be new, unused and without blemishes and shall be of manufacturer's current and standard production.
B. Contractor shall confirm all equipment part numbers with the Owner/Architect/Engineer prior to ordering equipment and updating submittals as required.
C. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory installation and operation.

D. Product Availability

1. Prior to submitting a project bid, the contractor shall determine product availability, delivery time, and shall include such considerations into the base bid for the communications systems scope of work as defined in the construction documents.

2.2 CONDUIT AND RACEWAY

A. See specification section 27 05 00 for additional information and requirements

2.3 WIRE AND CABLE

A. Provide all new wire and cable required to install systems as indicated on construction documents.
B. Category 6A cable shall meet or exceed IEEE 802.3 for Gigabit Ethernet.
C. Category 6A underground cable shall be rated for the application intended.
D. Cable management system shall be installed to provide a complete management system.
E.

2.4 PATCH CORDS

A. See specification section 27 16 00 for additional information and requirements

2.5 LOW VOLTAGE ENCLOSURES AND PATHWAYS

A. See specification section 27 05 00 for additional information and requirements

2.6 EQUIPMENT

A. See specification section 26 for additional information and requirements

PART 3 EXECUTION

3.1 INSTALLATION

A. The cables will be routed to their respective Main Distribution Frame (MDF) or Intermediate Distribution Frame (IDF), to Node Termination Point (NTP) utilizing the shortest path possible while maintaining right angles to the building structure.

B. Data UTP:

1. Data terminations shall be T568B configuration.
2. Patch panels shall be installed in accordance with manufacturer's installation guidelines.

3. Labeling

   a. Handwritten labels are not acceptable.
   b. Cables shall be labeled no more than 4" inches back from each end of the termination point with a cable label that matches the station outlet labeling.
   c. Wiring termination locations shall be labeled to corresponding pairs at the MDF / ER, IDF / TR, and at each station outlet end.
   d. Contractor will provide tags, straps, and adhesive labels. These tags, straps, and adhesive labels shall be of high quality that will endure over time.

4. Labeling Scheme

   a. Workstation labeling:
      i. The faceplate or surface block shall be labeled with the MDF / ER, or IDF / TR number (#), sequential station outlet number for the MDF / ER, or IDF / TR (ex. 1.1-09).
      ii. The labeling itself shall be in a white background with black lettering.

   b. MDF / IDF labeling:
      i. Patch panel shall be labeled with the sequential station outlet number to match station outlet labeling.
      ii. The labeling itself shall be in a black background with white lettering.

   c. Data UTP Testing

      i. All data UTP cable shall be tested after installation according to the procedures and

acceptability criteria described in ANSI/TIA Standards for Category 6 or Category 6A cable and connecting hardware. Test at level IIIe compliance or higher.

ii. Data UTP cable shall meet or exceed requirements for 10Gbps for Cat6A.

iii. Test results will be submitted per Section 27 00 00.

C. Manufacturer's specification for pulling stress and minimum bend radius shall not be exceeded on any Category cable.

D. Station Cable (UTP) or (STP) runs shall not exceed 295’ feet (90 meters) on the permanent link.

3.2 CABLE

A. Design, layout, size, and plan new cable runs as required.
B. All wire and cable passing thru metalwork shall be sleeved by an approved grommet or bushing.
C. Conduit/raceway fill shall not exceed 40 percent of interior cross-sectional area.
D. Identify all cables at terminations. Identification shall be made with an approved permanent label, machine generated 1/4” black letters on white tape (Brady or equal.)
E. Underground cable shall be rated for use.
F. Neatly dress and secure / strap all cabling.

3.3 WARRANTY, TESTING, AND COMMISSIONING

A. Refer to Division 27 00 00 for requirements.

3.4 CONTRACTOR CLOSEOUT DOCUMENTS AND TEST RESULTS

A. Refer to Division 27 00 00 for requirements.

END OF SECTION 27 15 00

SECTION 27 51 29

EMERGENCY RADIO COMMUNICATIONS SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. These specifications include the requirements for furnishing and installing a radio system to provide communications for both staff members and first responders within the Mono County Jail associated with this project.

B. It is the intent of this Specification to provide for a complete, integrated, working system. Inadvertent omission of any necessary items of work, material, or equipment shall not negate the Contractor's responsibility to provide those items.

C. Provide all labor, materials, appliances, tools, equipment, facilities, transportation, and services necessary for or incidental to performing all operations of the Work of this Specification, complete, as specified herein.

D. Furnish, and install all necessary antennas, splitters, interconnecting cabling, and connectors to completely implement the Distributed Antenna System (DAS) described in this specification and the attached Contract Drawings.

E. Install radio communication equipment in the Communications Shelter.

F. Provide a Distributive Antenna System (“DAS”) in the Jail as described in this Section. The contractor shall provide and install RF power dividers, antennas, RF transmission lines, conduit, cable mounting hardware, antenna/power divider enclosures, antenna mounts, grounding, and other equipment described herein. The contractor is responsible for providing a complete, functional DAS that meets the requirements of this specification.

1.2 QUALITY OF WORK

A. All equipment, material, and articles incorporated in the work covered by this contract are to be new and of the most suitable grade for the purpose intended. All work under this contract shall be performed in a skillful and workmanlike manner.

B. Engineer shall have the right to reject any equipment based on an integral part that he or she deems to be substandard.

C. All cabling shall be appropriately labeled.

1.3 SUBMITTALS

A. General

1. Ten copies of all submittals shall be submitted to the architect, engineer, and owner for review.

2. All references to the manufacturer’s model numbers and other pertinent information herein are intended to establish minimum standards of performance, function, and quality.

3. Equivalent compatible equipment from other manufacturers may be considered as a substitution for the specified equipment as long as the minimum standards are met.
4. Substitute equipment proposed as equal to the equipment specified herein shall meet or exceed the minimum specified standard. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. As-Built Drawings

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Wiring diagrams shall indicate all wiring for each item of equipment and the interconnections between the items of equipment.
3. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

C. Applicable Standards – use the latest edition as applicable

1. NFPA 1225 (2022) – *Standard for Emergency Services Communications*
2. NFPA 72 – *National Fire Alarm and Signal Code*
3. NFPA 70 Chapter 8 – *Communications Systems*
4. ATIS 0600333 13th Edition (2018) - *Grounding and Bonding of Telecommunications Equipment*
5. ATIS 0600311 (2007) DC Power Systems – *Telecommunications Environmental Protection*
6. UL 2196 - *UL Standard for Safety Tests for Fire Resistive Cables*

1.4 WARRANTY

A. Furnish all system support and all warranty maintenance and repairs required to operate the Mono County Jail communication system. Provide the specific warranty and support provisions for the Mono County DAS communication system as specified in this Section.

B. Except as otherwise expressly provided in this Contract, the Contractor shall remedy at his own expense any failure of the Work for a period of one year to conform to Contract Specifications.

C. Failure of work includes any defect of material, workmanship, or design in the Work (but excluding any defect of any design furnished by Mono County under this Contract) provided that the Contracting Officer or the Authorized Representative gives the Contractor notice of any such failure or defect promptly after discovery but not later than 1 year after final acceptance of the Work.

D. In the case of defects or failures in a part of the Work of which Mono County takes possession prior to final acceptance, such notice shall be given not later than one year from the date Mono County takes such possession.

E. The Contractor, at his own expense, shall also remedy damage to equipment, the site, or the buildings or the contents thereof, which is the result of any failure or defect, and restore any Work damaged in fulfilling the terms of this article.

F. Should the Contractor fail to remedy any such failure or defect within a reasonable time after receipt of notice thereof, Mono County shall have the right to replace, repair, or otherwise remedy such failure or defect at the Contractor's expense. This warranty shall not delay the final acceptance of or final payment for the Contract Work.

PART 2 PRODUCTS

2.1 SYSTEM OVERVIEW

A. All equipment and cabling will be housed and configured to meet NPFA requirements for survivability and waterproofing.

B. The “Jail” Channel base station shall operate at 151.040 MHz; County to provide PL/DPL tone.

C. The CRIS (California Radio Interoperability System) will provide a four-channel trunked site located in the new shelter

2.2 SYSTEM COMPONENTS

A. One 50W VHF base station, Tait model 9400 or approved equivalent configured for analog conventional operation, DFSI (Digital Fixed Station Interface), and -48VDC input power (12VDC Aux).

B. EMR Model 6454/SBC passband cavity or approved equivalent. Final selection subject to modification to coordinate with pending CRIS trunked frequencies.

C. UL-2196 certified ½” coaxial cable, RFS model number 2HB12-50JPLR or approved equivalent. The jacket must meet a 2-hour rating and be plenum-certified. Total length as required per DAS drawings.

D. EMR Line-Taps and splitters per Sheet EY-611

E. Cable connectors with quantities as shown in Sheet EY-611.

F. Two (2) lightning arrestors with N-female connectors, bandwidth 125 MHz-1GHz, Polyphaser model number IS-B50HN-C2 or approved equivalent

G. Three (3) grounding kits for 5/8” coaxial cable, Eupen model GK-S58 or approved equivalent.

H. 5/8” Coaxial Cable, Eupen model EC4.5-50 or approved equivalent. Sufficient length to connect the tap near the combiner to the DC Block in the main building as well as from the lightning arrestor to the antenna mounted on the tower.

I. 1/2” Flexible coaxial cable, Commscope model FSJ4-50B or approved equivalent for connections between repeaters, combiners, and lightning arrestors.

J. One (1) VHF 2.5 dBd omnidirectional antenna, EMR model number 150FC2 or approved equivalent. The vendor shall provide all mounts and clamps. A 6’ standoff mount will be used for the antenna.

K. Cushions shall be used to support 5/8” cable from the shelter to the antenna. Valmont model SRLR94-K or approved equivalent.

L. (12) APC/OM3 fiber cables connecting MDF and Communication Shelter

M. Isolation Transformer, 480 Delta Primary 208Y/120 Secondary 60 Hz, 30 kVA; Hammond Power Solutions model SG3A0030KB0C or approved equivalent.

N. Concrete pad for Isolation Transformer

O. Asentria SiteBoss 550 Alarm monitor or approved equivalent.

P. Patch Panels for APC/OM3 fibers terminating in the shelter and MDF room.

2.3 SYSTEM CONFIGURATION

A. The DAS will be connected to the CRIS site. The State shall provide all radio equipment and present a duplexed output to the DAS connected to a 50/50 splitter. One output of the splitter will feed a 5/8" coaxial cable going to the Jail building via an underground conduit. The other output of the splitter will go to a lightning arrestor via ½" "Superflex" cable and out to the antenna at the top of the 60' tower via 5/8" coaxial cable. The exterior cable will be grounded at the antenna, the bottom of the tower, and at the entrance to the shelter with ground kits.

B. The County backup base station will be connected to a EMR150FC2 omnidirectional antenna and mounted at the 20' AGL on the tower on a 6' standoff.

C. The 5/8" cable running through the underground conduit will be connected to a DC Block to isolate any differences of potential between the shelter and the Jail.

D. The contractor shall configure the DAS as shown in the drawings unless the Engineer has approved an alternate configuration.

1. The line-tap/splitters shall be set to the power ratios (based on VHF coupling) listed in the table on Sheet EY611.
2. Two-inch metal conduit shall be used to accommodate all coaxial cables.
3. Metal junction boxes shall be used for all line taps and splitters and shall be sized to accommodate the splitter/line-tap and all connections, minimum of 8"x8"x4". The junction boxes shall be NEMA 4 rated. The junction boxes shall have a back panel to mount the line taps and splitter while maintaining NEMA 4 rating.

E. The isolation transformer will be used along with the DC Block on the coaxial cable and the choice of fiber cable to electrically isolate the Jail and the Communications Shelter.

F. Coordination with the pending CRIS trunked site may be required to tap that site into the DAS system. All CRIS equipment and installation to be provided by others.

G. Place twelve additional pull strings in the conduit between the Jail and Shelter for future cables.

PART 3 EXECUTION

3.1 GENERAL

A. Installation Conditions and Requirements

1. Verbal statements by or opinions of Mono County relating to the existing system, site conditions, and installation conditions and requirements will not be considered binding.

2. The Contract Drawings indicate the general arrangement of circuits, conduit runs, equipment racks, antennas, transmission line runs, and other work. The information shown on the Contract Drawings is schematic; however, reconfiguration will not be permitted without specific acceptance.
3. Data presented on the Contract Drawings is as accurate as planning can determine, but accuracy is not guaranteed and field verification of all dimensions, locations, levels, etc., to suit field conditions is required.
4. The contractor shall review all Contract and Reference Drawings, and Specification and adjust all work to conform to all conditions shown therein.

3.2 WIRING AND WIRING PRACTICES

A. Wires and cables shall be installed according to the following:

1. All conductors shall be copper, of not less than 98 percent conductivity. Aluminum conductors, including coaxial cable, are not permitted.
2. Conductors shall be continuous between terminals, without splices.
3. Conductor gauge, insulation, and shielding shall be adequate for the intended purpose.
4. Cable and wire shall be run neatly, with adequate lacing or clamping. Fiber optic cable shall be supported in such a manner that no crushing will occur; no tie wraps.
5. Consistent color coding shall be used throughout.
6. All applications requiring physical movement and flexing shall use stranded conductors.
7. Eye-type, crimped or soldered lugs shall be used with stranded wires terminated on screw-type terminals. Connections shall be made only with crimping tools that meet the connector manufacturer's specifications and have been adjusted in accordance with the crimping too manufacturer’s requirements. All crimp connections shall be irreversible and shall imprint the manufacturer’s listing mark.
8. Shielded wiring, or other means of signal isolation, shall be used wherever necessary to avoid cross-talk, hum, pops, clicks, and other forms of interference. The Contractor shall provide an interference-free system.
9. Unless installed in conduit, wiring within console cabinets, beneath raised floors, and from outlet boxes to free-standing or desk-mounted equipment shall be neatly installed, bundled with appropriate tie-wrap devices, and tied to supports if practicable.
10. Cable and wiring penetrations through metal cabinets shall be insulated with dielectric grommets. Any penetrations shall be made to maintain NEMA 4 ratings.
11. Extra wiring necessary for equipment movement shall be neatly coiled, tied, and concealed.
12. Any cable passages from one fire-rated area to another shall be packed with approved sealant to preserve fire-rating integrity.
13. Cables, wiring forms, and other interconnecting equipment shall be identified by permanent labels, tags, or other appropriate means.
14. Marking shall clearly indicate the function or source. Cables shall be identified at both ends with indications of the source and destination of that cable run. The cable identification shall agree with the wiring and interconnect diagrams.
15. All grounding shall meet TIA J-StO-607-A Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications and ANSI/ATIS 0600333-2013 – Grounding and Bonding of Telecommunications Equipment.

3.3 ANTENNA LOCATIONS

A. The Contractor shall field verify the actual locations to assure that the conduits, wire ways, transmission lines, and antennas can be mounted as shown in the drawings at each location.

3.4 ANTENNA INSTALLATION

A. Equipment cabinets, antenna transmission lines, and antennas may be relocated within reasonable limits as necessary to avoid conflicts with light fixtures, conduits, pipes, or other equipment.

3.5 INSTALLATION OF EQUIPMENT

A. Install all equipment listed in Section 2.2 as depicted in the drawings.

B. Ground equipment to racks per ANSI T1.333-2001.

C. Align, test, and program the base station.

D. Sweep the filter to verify tuning.

E. Provide and install the (12) APC/OM3 cables and terminate in vendor-provided panels on both ends.

F. Provide additional cable pull-strings in all conduits connecting the Jail and shelter.

G. Run power from Main Jail to Isolation Transformer and Isolation Transformer to electrical panel.

H. Rectifiers for the County backup base station and other equipment to be provided by the County. Rectifiers and battery backup for CRIS to be supplied and installed by the State.

I. Provide and install lightning arrestors at the trapeze furnished with the shelter.

J. Provide and install 2” conduit for all interior coaxial cable in the Jail as shown on drawings. All splitters/taps shall be located within junction boxes as shown on drawings.

K. Provide and install antenna, antenna clamp, and antenna mount on the tower. Use grounding clamps to bond the outside conductor of the cable near the antenna, at the base of the antenna, and the building entry following NFPA 70 Article 820 and ATIS specifications.

L. All ground connections to the Primary Bus Bar shall use two-hole lugs with bolts for both holes being used, and the nut side shall have a locking washer. Self-tapping screws, captive nuts, and star washers are not permitted. The conductors from the Primary Bus Bar to the Rack Bus Bars shall use 2-hole lugs on both ends.

M. No washers should be inserted between the conductive surface of the lug and the bus bar.

N. All lugs shall use exothermic or irreversible compression crimp connections.

O. The bonding conductor from the coaxial cable SPD (lightning arrestor) to the Primary Bus Bar shall be a minimum #6 AWG copper.

P. Connections from individual equipment to the Rack Bonding Bar may use single-hole lug connections, the bonding conductor shall be a minimum of #6 AWG or per the equipment vendor's instructions, whichever is greater.

3.6 DAS SYSTEM TESTS - FIELD TESTING

A. After installation of RF equipment, the following tests shall be performed and documented for each RF link (from the duplexer to each attached antenna and from each donor antenna to its associated interior antenna):

1. Swept Return Loss (150-174 MHz).
2. Total RF Loss (dB).
3. The results of these tests shall be provided in either graphical or tabular form in the Field Test Report.

B. All installed coaxial cable transmission lines shall be swept for VSWR (return loss) and Attenuation over the frequency range of 150-174 MHz.

C. Each coaxial cable segment shall be tested with a TDR (Time Domain Reflectometer) to demonstrate that there are no significant discontinuities or "impedance bumps" in the line segment.

D. VSWR (return loss) tests shall be performed from each end of each cable segment with the opposite end terminated with a 50-ohm load.

E. Attenuation and TDR tests may be performed from one end only.

F. All installed coaxial cable segments shall comply with the manufacturer's VSWR and Attenuation specifications.

G. Test power out of the transmitter and power out of the combiner for both transmitters.

H. Test the receiver sensitivity of each receiver.

I. Measure the insertion loss of the combiner from all four ports to the final "T" of the combiner.

J. Measure the return loss of the combiner at the first load of combiner.

K. The results of these tests shall be provided in either graphical or tabular form in the Field Test Report. The printed TDR graphs for each test shall be included in the Field Test Report.

L. The on-site acceptance tests, to be witnessed by representatives of Mono County, shall demonstrate and verify the following:

1. All fixed equipment and other items have been supplied and installed in compliance with the contract conditions.
2. All equipment and other items perform following the technical specifications.
3. Documentation of on-site acceptance tests shall include a report on the specific measurements of equipment functional performance.

M. The documentation shall include a diagram or description showing the test measurement configuration and indicating the test equipment used to make the measurements. Equipment descriptions shall include the most recent calibration date for each piece of test equipment used in the tests.

1. Field Test Measurement Report.
    a. Submit a report to Mono County after Field Tests documenting the results of all measurements described in this section. Documentation shall consist of original test data sheets and other documentation generated from the tests, as described below. The documentation shall include a diagram or description showing the test measurement configuration and indicating the test equipment used to make the measurements. Equipment descriptions shall include the most recent calibration date for each piece of test equipment used in the tests.
2. As-Built Documents
    a. After completion of acceptance testing, the contractor shall submit complete as-built documentation of the DAS system including actual locations of antennas and transmission line runs for each floor, configuration, and interconnection of all antenna systems (DAS antenna system and passive systems), and cabinet mounted equipment, location of equipment items in racks or on walls for wall-mounted equipment, and any other documentation required to completely document the as-built configuration of the DAS system.

3.7 FINAL ACCEPTANCE

A. Final acceptance of the system shall consist of successful completion of all acceptance tests, submittal by the Contractor of all as-built drawings, test results, manuals, and other documentation, completion of Contractor-provided training, correction of all deficiencies, delivery of spare parts by the Contractor to Mono County, and final clean-up of installation sites.

END OF SECTION

SECTION 280510

COMMON WORK RESULTS FOR ELECTRONIC SECURITY SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. General:
   1. Furnish all labor, materials, tools, equipment, and services for all electronic systems work as indicated, in accord with provisions of Contract Documents.
   2. Completely coordinate with work of all other trades.
      a. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
   3. See Division 01 for General Requirements.

B. Drawings use and interpretation:
   1. Drawings are diagrammatic and indicate general arrangement of systems and equipment, except when specifically dimensioned or detailed.
   2. Field measurements take precedence over dimensioned drawings.
   3. Intention is to show size, capacity, approximate location, direction and general relationship of one work phase to another, but not exact detail or arrangement.
   4. Field verify locations and arrangement of all existing systems and equipment.
   5. Where ambiguity may exist between specifications and drawings, the most stringent shall apply.

C. Installation of all systems and equipment is subject to clarification as indicated in reviewed shop drawings and field coordination drawings.

D. Dimensions indicated anywhere are limiting dimensions.

E. Do not use equipment exceeding dimensions indicated or equipment or arrangements that reduce required clearances or exceed specified maximum dimensions.

F. Description of systems: Furnish and install all materials to provide functioning systems in compliance with performance requirements specified and any modifications resulting from reviewed shop drawings and field coordinated drawings. Electronic security systems work as specified in this section includes:
   1. Providing all equipment to provide a functional integrated system indicated in the contract documents.
   2. Providing special back boxes for field devices.
   3. Providing equipment cabinets and enclosures.
   4. Providing wiring for electronic systems.
   5. Providing raceway systems for electronic systems.

G. Electronic Security Systems:
   1. Common Work Results for Electronic Security System Section 28 0510

2.	Cabinets and Enclosures:	Section 28 0555
3.	Access Control System:	Section 28 1300
4.	Video Management and Recording System	Section 28 2300
5.	Electronic Control System:	Section 28 4619
6.	Touch Screen Control and Management System:	Section 28 4623
7.	Digital Intercom and Paging System:	Section 28 5123
8.	Uninterruptible Power System:	Section 28 5045

H. Description of systems: Furnish and install all materials to provide functioning systems in compliance with performance requirements specified and any modifications resulting from reviewed shop drawings and field coordinated drawings.

I. Furnished by Electronic Systems Integrator for installation by Division 26:
   1. Non standard electrical boxes.

J. Furnished and installed by Division 26:
   1. Complete raceway system from the main head end equipment to the end device, including any necessary standard size back boxes, wire ways and pull boxes. Install pull string in all conduits.
   2. All 120 volt AC wiring and connections for power panels and/or terminal strips in electronic panels, cabinets, enclosures or consoles.
   3. All 120 volt AC wiring, devices and connections for devices and equipment as indicated on drawings.
   4. The Electronic Systems Integrator shall furnish conduit requirements and special back boxes to the Division 26 installer in a timely manner so as not to impede the progress of the work. Conduit sizing shall allow for a maximum conductor fill of 40 percent of conduit cross sectional area. Where pneumatic tubes are included in raceway system, the tube shall be included in the fill requirement.
   5. The Electronic Systems Integrator shall be responsible for any additional conduits required (not shown on drawings) or increase in size of conduit to effect the installation of the security system contained herein.
   6. Data interface using standard industry protocol for data communication (e.g. BACfnet) between electronic security system and control systems provided by Div 26 contractor such as detention area lighting control and power control etc.

K. Related work:
   1. Division 8
      a. Commercial Door Hardware: Section 087100
   2. Division 11
      a. Detention Door Hardware:
   3. Division 26
      a. Raceway systems: Section 260533
      b. Building Wire/Cable: Section 260519

1.2 BASIS OF DESIGN

A. The electronic security system described within the specifications and drawings shall function as an integrated system. Although the system is made up of several sub systems, they shall be integrated in both physical and electronic manner to achieve a single system presentation and

functionality to the operator. The control stations shall function as a single control point, appearing to function as a single system.

B. The integrated system is made up of several subsystems that communicate with each other via a fault-tolerant, self-healing network. The network is Ethernet based with primary controlling systems connected to the managed network switches. The network switches will direct all communications to and from all devices connected to the systems.

C. Control of door locks, detention are lights, receptacles, phones, etc. will be managed via distributed programmable logic controllers (PLC). Programmable logic controllers shall be located in each electronic security equipment room. Each PLC shall be connected to the Ethernet network and shall be capable of stand-alone operation in the event of network connection failure.

D. The intercom switching system will be a digital intercom system with software based configuration, fault tolerant design, and rugged c construction. The system is integrated to control stations via the electronic security network, allowing intercom functions to occur between each control station and their assigned remote intercom stations and speakers. Cat6 cable shall be used for wiring between intercom stations and closest network switches. If the Cat6 cable length exceeds 300’ fiber optic cable and converter(s) shall be provided.

E. Touch screen control and management system shall provide the means to control and monitor all security devices in the facility via the electronic control system. Additionally it shall provide archiving of events to a database with ability to generate reports from that database. The touch screen control system shall be configured to allow control transfer between the stations so that any touch screen station in the facility can control and monitor entire facility.

F. Control of devices such as detention area lights, and power receptacles, etc. shall be control via electronic security control system using data interface between the security system and other trades.

G. The access control system will be a computer based Building/Facility Management and Monitoring System used to control and monitor personnel and alarm activity. Access control panels (controllers) shall use fully distributed database architecture with real-time processing performed at each panel (controller). The fully distributed processing shall provide that all information (time, date, valid codes, access levels, etc) is downloaded to the controllers so that each controller makes its own access control decisions. There shall be no hierarchical or intermediate processors to make decisions for the controllers. Also access control system server/workstation shall not be required to make any decisions for the controllers including any global functions, providing instant response to card reads regardless of system size and provide for no degradation of system performance in the event of communication loss to the host (or actual loss of host). All time zones, access levels, linking events, holiday schedules, and global functions shall remain operational. Upon communication loss to the host all controllers shall automatically buffer event transactions until the host communications is restored, at which time the buffered events shall be automatically uploaded to the host. The system shall maintain full feature capability regardless of the style of the communications from the server.

H. The video management system shall be an IP network-based, fully distributed digital video system that will be provided by the electronic security system integrator/contractor. The security video system will utilize local area networks (LAN) as a transmission medium for video, configuration, as well as storage of all data. The security video system shall provide full video

control at the Mono County Jail, with additional full selection capability at any point within the network from any workstation or a video console display. The security video system shall provide unlimited expansion capability for the addition or modification of video inputs. The purpose of the video surveillance system is to provide visual confirmation of movement through security barriers and general surveillance of movement. The digital, high resolution IP video cameras will be used throughout the building and around the building perimeter. High resolution cameras will be mounted outside each perimeter access control door to provide the necessary verification of all activity at the entrance. Video IP cameras will be in all areas of the building that require monitoring for reasons of security. All cameras shall be recorded and video storage shall be sized to retain recording for 365 days. All cameras shall be continuously recorded at native resolution, 15 images per second. Quite time recording (no motion) shall be native resolution, 2 images per second for all cameras. The motion should be estimated at 70%. Miscellaneous devices (i.e. motion detectors, call buttons, duress buttons, and etc.) shall be configured as inputs to the local PLC with status displayed on the control stations.

I. The facility is to be provided with a Touch Screen Control and Management System for facility wide control and monitoring functions. This subsystem shall also provide system administration, archival, database management, and report generation. Touch screen control and management system shall provide the means to control and monitor all security devices in the inmate holding area via the electronic control system. Additionally it shall provide archiving of events to a database with ability to generate reports from that database. The officers (with authorized password and ID) shall be able to transfer control of certain areas between the touch screen stations to adjust their work load. The system consists of three (3) new touch screen control stations, an administration station, and a file server.

J. All security systems shall be powered from the emergency power systems with additional backup from uninterruptible power systems for all components other than electrically control door locks, sliding doors, overhead doors, and similar motor or solenoid loads. UPS backup shall be provided for a minimum of 20 minutes at full connected load.

K. All contractor provided hardware (including but not limited to CPUs, IP cameras, monitors) and software (including but not limited to HMI, operating systems, VMS) shall be the latest available products on the market at the date of the project implementation and no more than 6 months prior to the system installation. All updated products shall be resubmitted for the final review and approval.

1.3 WARRANTY (SEE DIVISION 01)

A. Manufacturer’s warranties that extend beyond the requirements of Division 01 shall be maintained and transferred to the Owner.

B. The existing equipment that is to be re-used need not be warranted. However such exception to the warranty are limited to the equipment itself and excludes damage by the contractor. All installation, operations, functionality, programming, etc. remains included in the required warranties.

C. Respond within four (4) hours to an emergency maintenance request. Provide a twenty-four hour telephone contact number (24 hours per day, 365 days per year). Service response time is defined as the period between the placing of a service request and established communications with the designated client representative. Emergency repair personnel shall be

on-site within 24 hours of notification and repair or replacement of defective equipment shall be completed within 72 hours of notification.

D. Maintain a sufficient parts inventory during the warranty period to meet the anticipated system repair times. Contractor shall monitor spare equipment inventory and replenish materials used in an expedient manner.

E. Prior to expiration of warranty, system integrator shall provide all software patches available from software supplier. Upon completion of installation, test affected systems to confirm operation. Software patches shall be installed at time convenient to Owner/User considering potential for security impact.

F. All computing equipment shall be provide with, and software applications compatible with Windows 10 and Microsoft Server 2019 operating systems. If Windows Microsoft Server 2019 compatibility is not available, a Microsoft Server 2016 operating system may be installed. In such a case, the contractor shall upgrade the installed systems to Windows 10 and Microsoft Server 2019 operating systems prior to expiration of warranty and subsequently extend the warranty related to the system upgrade for an additional one year.

G. See individual sections for additional warranty requirements.

1.4 QUALITY ASSURANCE

A. Perform all work in accord with following codes and standards:
   1. Codes Compliance: Comply with the following current adopted codes:
      a. Federal, state and local codes, regulations and ordinances.
      b. National Electrical Code (NEC), latest edition
      c. National Fire Code (NFC)
      d. Occupational Safety and Health Act (OSHA)
      e. International Building Code (IBC)
      f. Factory Mutual System (FM) requirements
      g. All authorities having jurisdiction.
   2. Standards Compliance: Comply with the following standards as applicable:
      a. Americans with Disabilities Act (ADA)
      b. American National Standards Institute (ANSI)
      c. American Society for Testing and Materials (ASTM)
      d. Electronics Industry Association (EIA)
      e. Electrical Testing Laboratories (ETL)
      f. Factory Mutual (FM)
      g. Institute of Electrical and Electronics Engineers (IEEE)
      h. Insulated Cable Engineers Association (ICEA)
      i. National Electrical Contractors Association (NECA)
      j. National Electrical Manufacturers Association (NEMA)
      k. National Fire Protection Association (NFPA)
      l. Underwriter's Laboratories (UL)

B. Equipment Manufacturer:
   1. Regularly engaged in the manufacture of products specified.
   2. Manufacturer of products specified for a period of no less than five years with satisfactory performance in similar applications.

C. System Integrator Personnel: (Project Manager, Project Engineer, On-site Supervising Technician)
   1. Regularly engaged in installation of products specified.
   2. Installer of products specified for a period of no less than five years with satisfactory performance.

D. Systems specified in this Division shall be engineered, assembled and installed under the direction of a pre-qualified electronic systems integrator. Electronic systems integrator shall meet the following minimum requirements.
   1. Qualifications.
      a. Successful completion of at least three similar detention facilities which have been in successful operation for at least one year.
      b. Technical staff experienced and factory trained in systems specified.
      c. The electronic systems integrator shall be bondable for an amount equal to 100% of his bid.
   2. Pre-qualified electronic systems integrators.
      a. Accurate Controls, Ripon, WI
      b. Cornerstone Electronics, Madison, Alabama
      c. CML Security, Erie, CO
      d. Esitech, Richmond, VA
      e. Johnson Controls, Boca Raton, FL
      f. Stanley Convergent Security Solutions, Noblesville, IN
      g. South Western Communications, Decatur, AL
   3. Electronic systems integrators must be pre-qualified to bid the project. Integrators not indicated but desiring approval shall submit information supporting compliance with the following minimum requirements.
      a. Minimum five (5) continuous years in the business of installing electronic security systems in justice/detention and or correctional facilities incorporating systems and equipment including but not limited to intercom/paging, programmable logic controllers, touch screen control, access control, and video management systems.
      b. Successful completion of at least three justice/detention facilities of similar size and complexity that have been in operation for at least one year.
         1) Successful completion shall be determined by information from references confirming project was not delayed by the completion of electronic security systems, electronic security systems were fully operational within 90 days of substantial completion and electronic security systems remained fully operational at conclusion of warranty period or two years whichever is greater.
         2) Projects of similar size are represented by construction cost value in excess of one and half million dollars ($1,500,000.00).
         3) Projects of similar complexity are represented by integrated systems including but not limited to intercom/paging, programmable logic controllers, touch screen control, operating in a network environment with a minimum five (5) equipment locations (nodes)
      c. References: The Mono County and/or its representative(s) may at their own discretion contact references for projects in addition to those submitted by the applicant.
      d. Definitions:
         1) Similar Size: Justice/Detention Facility of…
            a) Similar dollar value of installed electronic security systems
            b) Similar duration (12 months)
            c) Similar systems technology

2) Similar Complexity: Justice/Detention Facility …
   a) Using integration of multiple systems including video, communications, and control.

E. Termination, testing and start-up of electronic systems shall be done under the direct supervision of the system integrator. Prior to termination at system equipment, all field wiring shall be tested against faults, grounds and other conditions that may impede the proper operation of the system. System integrator shall verify and accept the field wiring prior to termination at system equipment. Beginning of termination constitutes acceptance of conditions as satisfactory.

1.5 SUBMITTALS (SEE SECTION 013300)

A. Review of shop drawings or schedules by Engineer shall not relieve the Contractor from responsibility for deviations from drawings or specifications, unless there is a formal letter which called attention to such deviations at the time of submission and secured written approval; nor shall it relieve him from responsibility for errors in shop drawings, schedules or coordination of the work with other trades.

B. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered. Partial submittals will not be returned except at the request and expense of the contractor.

C. The contractor shall develop and submit complete submittals and do so in a timely manner. By failing to do so, the System Integrator agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to do so.

D. Where Engineer furnished electronic files of the Contract Documents are used as part of the shop drawings, the Electronic Systems Integrator shall review such files and confirm completeness and accuracy. Submission of such documentation as a part of the shop drawings shall be indication that such review and confirmation has been performed and completed. Submission and subsequent approval shall not relieve the Electronic Systems Integrator from the requirements of the Contract Documents.

E. All shop drawings shall be created using AutoCAD v2017 or later. Schedules shall be created in spreadsheet format using Microsoft Excel. Incorporate all revisions upon completion of work. Submit with record drawings in both hard copy and electronic files.

F. Electronic submittal reviews:
   1. PDF submissions of narratives, data sheets, cut sheets and all other documents shall be created in their original size at a high quality resolution.
   2. Each PDF submission file shall have a page designated for a review stamp and general comments by the Engineer.
   3. Drawings being submitted in PDF form shall have minimum font sizes, preferably .125” but in no case smaller than 0.1”
   4. Drawings shall be in a high resolution format so as to not degrade when an area is enlarged while viewing.
   5. The original drawings should be converted to PDF’s at full scale.

6. PDF files should each be created by each general specification number/system and then all files & drawings as a group submitted as one complete submittal.
7. Do not create a single PDF file for the complete submittal.

G. Resubmittal of items that have been previously accepted or approved will not be reviewed unless specific attention is called to changes in previously approved items. Resubmission that does not specifically call attention to previously accepted or approved submittals shall not be considered as subsequent approval of a change to the initially accepted or approved item.

H. Submit drawings, data sheets, schedules, and others, in compliance with Article "Submittal Requirements" of this Section to permit adequate time for review by the Engineer, but in not less than 21 calendar days. This 21 day review period is exclusive of time associated with travel, mail, delivery, copy, and handling. Due to the integrated system, most submittals are interrelated and thus are expected in one group.

I. Provide information required for complete review of each item in one submittal. When individual sections of specifications require more than one item for review, such as shop drawings, product data, samples, and related items, submissions shall include all specified information delivered at one time.
1. Incomplete or partial submittals will not be reviewed by the Engineer.
2. Extra copies of submittals will not be marked or returned, except at the expense of the Contractor.
3. Duplicate copies of incomplete or partial submittals, or extra copies of submittals, will be discarded after 15 calendar days unless Contractor makes arrangement for return, at Contractor's expense.
4. Submittals not requested specifically may be returned to Contractor without review.

J. Review of submittals shall be limited to two submissions. The Engineer shall be compensated for additional reviews. In such an event, the Engineer will determine a cost for the additional review(s) based on previous review cost and provide to the Contractor. Upon receipt of payment, the Engineer will conduct the requested additional review(s).

K. Project Data: Electronic Systems General Requirements: Section 280510.
1. System Integrator personnel qualifications: (Project Manager, Project Engineer, On-site Supervising Technician).
2. List of all manufacturers and equipment suppliers.
3. Submittal schedule: Schedule shall be submitted within 30 days of Notice to Proceed and shall include time and duration for product data by group, shop drawings by group, touch screen demonstration station, and testing procedures.
4. Where modifications are required to existing control systems, the schedule shall include phasing with identification of the time and duration of modifications to each portion of the work. Time and durations shall be reviewed with the Owner/User in order to allow continuous operation of the facility
5. Functional block diagram of complete integrated system with references to all related sub-system drawings.
6. Floor plans indicating device locations and cable assignments/groupings. Submission of these plans indicates that the contractor has coordinated the placement of all devices with architectural plans, and coordinated raceway requirements with all related trades.
7. Drawings indicating complete conduit and raceway systems.
8. Spare parts inventory with quantity, description and source listed.

9. Testing: Provide complete testing procedure for electronic security systems. The procedure shall identify testing of each function of each device under each condition. Manufacturer recommended test procedures shall be incorporated into the testing procedure. All testing shall be project specific.
10. Construction schedule: A schedule of electronic security system construction phase work shall be submitted within 60 days of Notice to Proceed and shall include time and duration of each of the items listed at a minimum. The schedule shall be updated periodically as needed throughout the duration of the project with resubmission required at each update or modification, but no less than quarterly.
    a. Submittals (by group number where applicable)
    b. Conduit and Raceway installation
    c. Procurement
    d. Assembly (by equipment room location)
    e. Programming
    f. Factory Testing of completed system
    g. Shipping (by equipment room location)
    h. Terminations (by equipment room location)
    i. Field device installation (by building area)
    j. Contractor preliminary testing (by building area)
    k. Validation Testing
    l. Test Upon Completion of Work
    m. Operation and Training Manuals
    n. Shakedown Period
    o. Owner Training
    p. Final Testing
    q. Pre-Warranty Expiration Testing
11. Schedule of Values: A schedule of values for the electronic security systems shall be submitted within 60 days of Notice to Proceed and shall include material and labor costs for each part of the work. Values for the following shall be provided at a minimum.
    a. General Conditions: Section 280510
    b. Submittals: Section 280510
    c. Testing: Section 280510
        1) Factory Testing
        2) System Validation Testing
        3) Demonstration Upon Completion of Work:
    d. Programming: All Sections
    e. Cable and Wire: All Sections
    f. Conduit and Raceways: All Sections
    g. Access Control System: Section 281300
    h. Video Management and Recording System Section 282300
    i. Electronic Control System: Section 284619
    j. Touch Screen Control and Management System: Section 284623
    k. Digital Intercom and Paging System: Section 285123

L. Transient Surge Protection: Section 280510
    1. Project Data: Submit material specifications and installation data for products specified herein.
        a. Include electrical characteristics, and ratings for each type of TSP equipment.
        b. Indicate wiring diagrams indicating internal connections of TSP components within each enclosure.

c. Drawings shall be provided indicating unit dimensions, weights, mounting provisions, and connection details.
d. Submittals of each system shall indicate location of TSP devices.

1.6 WEATHERPROOF EQUIPMENT AND LOCATIONS

A. Weatherproof equipment and locations are where weatherproof (WP) is indicated or where equipment is not located inside a building.

B. Enclosures and boxes to be NEMA 3R hot dipped galvanized steel, weatherproof cast iron or malleable iron boxes and covers, or NEMA 4X stainless steel.

C. Mounting and support hardware to be hot dipped galvanized steel or stainless steel.

1.7 PROTECTION

A. Provide covering and shielding for all equipment provided to protect from damage.

B. Protect nameplates on equipment, to prevent defacing.

C. Repair, restore or replace damaged, corroded and rejected items.

1.8 DELIVERY, STORAGE AND HANDLING

A. Protect all materials and equipment from damage during storage at the site and throughout the construction period. Protect equipment and materials during shipment and storage against physical damage, dirt, dust, moisture, heat, cold, rain, and any foreign substances that may damage the equipment.

B. Prevent damage from rain, dirt, sun and ground water by storing the equipment on elevated supports and covering them on all sides with securely fastened protective rigid or flexible waterproof coverings.

C. Protect conduit by storing it on elevated supports and capping the ends with suitable closure material to prevent dirt accumulation.

D. Protect all fabricated and/or installed materials and equipment against dust, dirt, moisture, physical damage, metal debris and any foreign substances that may damage the equipment.

E. Protect painted surfaces with removable heavy Kraft paper, sheet vinyl or equal, installed at the factory and removed prior to final inspection.

F. Replace damaged equipment as determined by the Engineer. Repaint and finish damaged paint on equipment and materials with the same quality of paint and workmanship used by manufacturer so that repaired areas are not obvious.

1.9 OPERATING AND MAINTENANCE DATA (SEE SECTION 01 78 23)

A. Provide the following specific instructional material for this project for each electronic system. Product data shall be original data sheets. Copies are not acceptable. Product data, instructions and manuals from original packaging is preferred.
   1. Operations manual for all components and system as a whole.
   2. Maintenance manual for all components and system as a whole.
   3. Point-to-point diagrams, wiring diagrams and construction details.
   4. List of spare parts, materials and suppliers of components. Provide name, address and telephone number for each supplier.
   5. Emergency instructions for operational and maintenance requirements.
   6. Copies of all warranties.
   7. Delivery time frame for replacement of component parts from suppliers.
   8. Recommend inspection schedule and procedures for all components and system as a whole.
   9. Complete 'Approved' shop drawings and product data for all components and system as a whole.

1.10 JOB CONDITIONS

A. Cause as little interference or interruption of existing utilities and services as possible.
   1. Schedule work which will cause interference or interruption in advance with Owner, Architect or Engineer, authorities having jurisdiction and all affected trades.

B. Examine Contract Documents to determine how other work will affect the execution of electronic systems.

C. Determine and verify locations of all existing utilities on or near site.

D. Make arrangements for and pay for necessary permits, licenses, and inspections.

1.11 EQUIPMENT AND SYSTEM IDENTIFICATION

A. All electronic security systems and equipment shall be labeled for identification.
   1. Install a nameplate on each individual equipment rack, enclosure, boxes, cabinet, and significant equipment item with text to coordinate with approved submittal documents.
   2. Use identifiers and abbreviations defined in the Drawings whenever possible. Use plan designation for labeling, unless indicated otherwise.
   3. Nameplates shall be laminated black phenolic resin with a white core and engraved lettering, a minimum of 1/4” high. Use fasteners to install nameplates. Do not fasten with adhesives.
   4. Engrave using upper case letters of uniform height; centered on device, cover plate, or enclosure; with all characters made clearly and distinctly. Allow room for fastener attachment.
   5. All equipment shall have the manufacturer’s name, address, model number and rating on a nameplate securely affixed in a conspicuous place. All equipment shall bear labels attesting to Underwriters Laboratories approval where subject to Underwriters Laboratories label service.

6. Identify all field terminals and relays with device identification. Lettering shall be 3/16" high, minimum.

B. New raceway systems shall be labeled at all pull points and on each side of wall penetration, but in no case less than 20 feet between labels. Identify raceways with name of security system
   1. Apply preprinted labels with pressure sensitive, self-adhesive backing. If additional adhesion is required to hold label in place, use appropriate taping material wrapped completely around raceway.
   2. Position identification so that it is readily visible from eye level.
   3. Color scheme for labels:
      a. Communications: Orange
      b. Security Control: Green
      c. Video Surveillance: Blue
      d. Network: Yellow

C. All wire and cables shall have wire markers at each and every termination point. Each wire shall be identified by unique code.

D. Labeling system suppliers:
   1. Thomas & Betts
   2. Brady
   3. Westline
   4. Seton

1.12 RECORD DRAWINGS (SEE SECTION 01 7839)

A. The Electronic systems contractor shall keep a complete set of all electronic systems contract drawings and the electronic systems shop drawings in the job site office.
   1. Use these sets of drawings for showing as constructed installation of electronic security systems and equipment.
   2. Where any material, equipment, wiring or system components are installed differently from that shown, show such differences clearly and neatly using ink or indelible pencil.
   3. At project completion, submit the record set of contract drawings to Architect (see Division 01) in hard copy and electronic files in both PDF and AutoCAD format.
   4. At project completion, make corrections to the shop drawings on the original media and submit the corrected reproducible drawings to the Architect (See Division 01). Where the shop drawings were created on a computer aided drafting system, furnish AutoCAD compatible electronic drawing files of all corrected shop drawings.

B. Software Records:
   1. Submit final software programs on electronic media compatible with the installed system.
      a. Transfer all software licenses to the Owner/User representative at the completion of the project. Transfer shall include customer support rights.
      b. Fully comply with all license agreements for the installed software. Install sufficient quantities of each software program so that the Owner fully meets the intent of the publisher's site license agreement. When in doubt, contact the publisher for an interpretation and comply with that interpretation.
      c. Provide the Owner with all original installation media and manuals for every software program installed on the system.
   2. Standard and Custom Application Software:

a. Prepare and submit the licenses to all software installed for the system. Compile a list with each program name, its installed version number, the number of copies installed, the serial number of each copy, the publisher's name and address, and the publisher's customer support telephone number.
b. Prepare and submit complete documentation of the final installed version of the application program, including a diagram of its component modules, subroutines, databases, libraries, drivers, and other parts. Narrative descriptions shall accompany the diagram, giving basic descriptions of each component and describing the interaction between components. Provide a complete, annotated listing of all application settings.

3. User Data and User Programmable Software:
   a. Provide complete documentation of all user data and user programmable software, including but not limited to properties, preferences, settings, configurations, component modules, plug-in modules, user subroutines, databases, libraries, drivers, macros, templates, objects, slides, maps, images, sounds, icons, screen savers, and any other software files for each site.
   b. Provide narrative descriptions and diagrams that give basic descriptions of each software component and the interaction between software components. Provide a complete, annotated software component listing.
   c. Provide a FLASH DRIVE or equivalent media of the final operating version of the user data and user programmable software in accordance with Division 1 requirements. Provide three (3) copies of the media, properly labels and dated in hard cases.
   d. Provide record of all new IP addresses assigned to the electronic security system devices and equipment.
4. Operators Guide
   a. Operators Guide shall outline the operation of each system. A guide is to be kept at each workstation for reference on the operation of the equipment.
   b. Include written description in outline form how to operate the basics of the system. This shall include but not be limited to: access and control of individual devices, group control functions, emergency control functions, system acknowledgement and reset of alarms.
   c. Include 8.5 x 11 inch graphics as needed to identify device locations and facilitate understanding of the written description.
   d. Provide one copy for each work station and one master copy that may be reproduced by the County.
   e. Laminate each guide for each workstation, or other approved method.

PART 2 - PRODUCTS

2.1 GENERAL

A. Acceptable manufacturers:
   1. See individual specification section.

B. The product numbers contained herein are for reference only and may not be the most current available nor a complete listing of all features or options required. Where a manufacturer is listed without a product number, an equivalent item of the specified manufacturer is acceptable. Determination of equivalent is at the sole discretion of the Engineer. Where a conflict or

ambiguity exists between the written description and the product number, the written description shall govern.

C. Equipment installed in exterior applications shall be fitted with fasteners and exposed surfaces of stainless steel or other corrosion resistant material.

D. Use only prime quality, new materials, apparatus and equipment.

E. Use electrical materials approved by UL and bearing UL label where listing has been established for materials or devices in question.
   1. Manufactured items and fabricated assemblies of electrically operating equipment: UL approval or UL re-examination listing.

F. Structural steel for supports: ASTM A36.
   1. Galvanize members installed in areas of high humidity or condensation and exterior locations.
   2. Furnish other members with shop coat of red lead primer.
   3. Shop fabricate for field assembly using bolts.
   4. Minimize field welding.
   5. Retouch primer after field welding.

2.2 COMPUTING EQUIPMENT

A. All computing equipment shall be provided with, and software applications compatible with Windows 10 and Microsoft Server 2019 operating systems or later. In such a case compatibility is not available at the time of installation, it must be stated in writing during the submittal process, and the contractor shall upgrade the installed systems to Windows 10 and Microsoft Server 2019 operating systems prior to expiration of warranty and subsequently extend the warranty related to the system upgrade for an additional one year.

2.3 GROUNDING

A. All equipment shall be grounded in accordance with the NEC, these specifications and drawings, and the equipment supplier's recommendations.

2.4 TRANSIENT SURGE PROTECTION

A. Industry Reference Standards: The following specification and standards are incorporated into and become a part of this specification by reference.
   1. Underwriters Laboratories, Inc. (UL)
      a. No. 1449 2nd Edition Standard for Safety
      b. No. 497 A, B and C.
   2. Institute Of Electrical And Electronics Engineers (IEEE)
      a. Std. 142 - Recommended Practice For Grounding
      b. Std. 518 - Recommended Guide On Electrical Noise
   3. American National Standards Institute (ANSI)/IEEE
      a. C62.41.1-2002 - IEEE Guide on the Surge Environment in Low Voltage (1000V and less) AC Power Circuits.

b. C.62.41.2-2002 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000V and Less) AC Power Circuits.
c. C62.36-2000 – IEEE Standard Test Method for Surge Protectors Used in Low-Voltage Data, Communications, and Signaling Circuits.

4. National Electrical Manufacturers Association (NEMA)
   a. NEMA LS-1-1992 – Low Voltage Surge Protection Devices
5. International Electrotechnical Commission (IEC).
   a. IEC 529:1989 – Type of protection through housing.
   b. IEC 1024-1:1990 – Protection of structures against lightning – Part 1: general principles.
   c. IEC 61643-21 – Low Voltage Surge Protective Device: SPD Connected to Telecommunication and signaling networks – Performance requirements and testing methods.
6. Deutsch Industrial Norm (DIN)
   a. DIN EN 50022: 1977/DIN EN 50022: 1978-05 Mounting rails 35mm wide for snap-on mounting of equipment
7. Federal Information Processing Standards
   a. Publication 94 (FIPS PUB 94)

B. Acceptable manufactures: All device(s) shall be by the same manufacture.
   1. TSP Devices:
      a. Base: Northern Technologies, Inc., Phoenix Contact, Transtector Systems, Inc.
   2. Other manufacturers desiring approval comply with Division 1

C. All TSP devices installed shall utilize Silicon Avalanche Diodes (SAD) as the primary means of protection. Secondary protection shall be SADs or Metal Oxide Varistors (MOVs). Each protection circuit shall be independent of each other and neither circuit shall short to ground on clamping transient surges.

D. Each 120 VAC circuit or feeder required for the electronic control and monitoring system shall be provided with a TSP device.

E. Each electronic security system circuit containing metallic conductor (s) shall be provided with a TSP device when leaving the confines of a building. Each electronic security system circuit containing metallic conductor(s) shall be provided with a TSP device when entering a building. Circuits serving building mounted devices or equipment that are located below the roof that originate or terminate in the building it is attached to, do not require TSP devices.

F. Locate TSP device at first termination point within the building. Locate all TSP devices in cabinets or enclosures.

G. All TSP devices shall be provided with a ground connection. The ground circuit shall be sized in conformance with the manufacturer's written requirements for proper grounding for the associated device. The ground conductor shall be routed and connected to the nearest electrical system ground point.

H. Alarm contacts on TSP devices shall be connected to the electronic control system and annunciated as a system trouble alarm.

2.5 WIRING AND CABLE (AS IN MEANS AND METHODS OF SINGLE AND MULTIPLE CONDUCTOR CABLE INSTALLATION)

A. Power wiring: Single conductor cable, soft drawn, copper wire with type THWN 600 volt insulation, UL listed.

B. All cable shall be per manufacturer's written recommendation for the application and environment anticipated for this project, but in no case less than what is required by these specifications. All cable shall be of standard type available from multiple manufacturers. Replace cable determined to be inadequate for specified performance.

C. All Class 1 wiring shall be building wire of type specified in Division 16 work. Provide overcurrent protection for conductors in accordance with NEC. Minimum sizes as follows:
   a. Indication: 18 GA minimum.
   b. Control: 14 GA minimum.
   2. All Class 2 wiring may be single conductor or multiple conductor cables. Conductors to be stranded type tinned copper, 22 GA minimum, PVC insulated.

D. Pulling lubricant: Do not use cable pulling lubrication compound containing petroleum or other products which may deteriorate insulation.

E. Color coding of conductors:
   1. Power circuits: in accord with NEC.
   2. Lock wiring: per drawings, match lock device color code where possible, similar throughout project.

F. All cable installation shall be continuous from equipment/device terminal to equipment/ device terminal. No splicing of cables will be allowed.

G. Where connection to devices provided with factory installed wire leads is required, use "Wing nut" or "Wire nut" insulated conical spring-type connectors. Do not make

2.6 RACEWAYS, WIREWAYS, BOXES AND FITTINGS

A. Raceways, wire ways, boxes and fittings shall be provided under Division 28.

B. Raceways, wire ways, boxes and fittings shall be provided where indicated on drawings.

C. Conduit:
   1. Electrical metallic tubing (EMT) with compression connectors shall be used where concealed above ceilings and in equipment rooms.
   2. Rigid galvanized conduit shall be used where exposed conduit is required. Exposed conduit that is below15 feet above finished floor shall be anchored to walls or ceilings with two hole straps on no less than 24 inch centers.

D. All raceways shall be sized for maximum 40 percent fill. All conductors shall be included in fill calculations. Minimum conduit size shall be 3/4".

E. Lock pockets have limited capabilities to accommodate incoming and outgoing conduits. Lock pockets shall not be used for wire termination other than that required for connector of lock in

pocket. Wiring for no more than three (3) adjacent locks may be routed through a lock pocket, provided the lock pockets will accommodate such. Coordinate with Detention Equipment Contractor for conduit entries,

2.7 SPARE PARTS

A. Deliver spare parts in protective wrapping and packaging for proper storage.

B. Provide spare parts as indicated in individual specification section.

C. Spare parts shall be available to the Contractor to use as immediate replacements during the warranty period. The Contractor shall replace all spare parts used for the warranty requirements within 30 days of use.

D. Provide the following spare parts:
   1. Transient Surge Protection: two (2) of each type used.

PART 3 - EXECUTION

3.1 GENERAL

A. Use only workmen experienced in electronic security systems for installation of equipment and termination of wire/cable systems.

B. When changes in location of any work are required, obtain approval of Engineer before making change. Engineer may move any item prior to or at time of rough-in up to 5 FT - 0 IN without extra cost.

C. Do not change indicated sizes without written approval in accordance with Division 01 requirements.

D. Equipment Installation:
   1. Install all equipment in accordance with the manufacturer's recommendations, and accepted shop drawings.
   2. Install all equipment in compliance with NEC requirements, NECA's "Standard of Installation", and recognized industry practices.
   3. Do not attach electrical materials to roof decking, removable or knockout panels, or temporary walls and partitions unless indicated otherwise. Use hangers and other supports to support the equipment and materials, intended for this purpose.
   4. Locate equipment as close as practical to the locations shown on the Drawings.
   5. Maintain minimum 3-foot working clearances on each side of equipment or equipment racks where access is required to inspect, service, or adjust.
   6. Check equipment against available mounting space indicated on the drawings. Coordinate location of equipment with existing devices to minimize interference. Bring all conflicts or clearance problems to the attention of the Engineer during the preparation of shop drawings.

7. Where the Engineer determines that equipment installation is not conveniently accessible for operation and maintenance, remove and reinstall equipment in a conveniently accessible manner.
8. Remove and protect existing equipment that is to be reinstalled. Make modifications and adjustments as required for re-mounting devices.
9. Insure all equipment is adequately ventilated and installed in such a way (rack spacing, additional cooling, etc.) so ALL equipment never exceeds manufactures published maximum operating temperature.

3.2 CUTTING AND PATCHING (SEE SECTION 017329)

A. Perform or pay for all cutting, fitting, repairing, patching and finishing of work of other sections where it is necessary to disturb such work to permit installation of work. Repair or replace existing or new work disturbed.

B. Avoid cutting, where possible, by setting sleeves or frames, and by requesting openings in advance.

C. Before cutting obtain approval of Architect or Engineer.
1. Use only approved methods.
2. Cut all holes neatly and as small as possible to admit work.
3. Do not weaken walls or floors; locate holes in concrete to miss structural sections.

D. Locate openings and sleeves to permit neat installation of equipment.

E. Do not remove or damage fireproofing materials.
1. Install hangers, inserts, supports, and anchors prior to installation of fireproofing.
2. Repair or replace fireproofing removed or damaged, at no extra cost.

3.3 INSTALLATION OF EQUIPMENT

A. Install all equipment in accord with manufacturer's recommendations.

B. Provide all necessary anchoring devices and supports.
1. Use structural supports suitable for equipment, or as indicated.
2. Check weight and dimensions of equipment with shop drawings.
3. Do not cut or weld to building structural members.

C. Verify that equipment will fit support layouts indicated.
1. Where substitute equipment is used, revise indicated supports to fit.

D. Arrange for necessary openings to allow for admittance of equipment.
1. Where equipment cannot be installed as structure is being erected, provide and arrange for building-in of boxes, sleeves or other devices to allow later installation.

E. Prior to installation of electronic security equipment in control rooms and/or equipment rooms, complete all room finishes and provide a clean conditioned space for the electronic equipment installation. Maintain a secure, clean and conditioned space throughout the installation process. Where dust, dirt or moisture generating environment is anticipated or encountered after start of

installation of equipment, cease work and wrap/seal all equipment in waterproof protective material. When environment is clean and conditioned, protective wrapping shall be removed, equipment cleaned, and work resumed.

3.4 FIELD QUALITY CONTROL (SEE DIVISION 1)

A. Perform indicated tests to demonstrate workmanship, operation, and performance.
   1. Conduct tests in presence of inspectors of agencies having jurisdiction if required.
   2. Arrange date of tests in advance with, manufacturer and installer.
   3. Give all inspectors minimum of 24 hours notice.
   4. Furnish all labor and materials required for period of test.

B. Repair or replace equipment and systems found inoperative or defective and re-test.
   1. If equipment or system fails re-test, replace it with products which conform to Contract Documents.
   2. Continue remedial measures and re-tests until satisfactory results are obtained.

C. Test equipment and systems as indicated for each item, unless otherwise recommended by manufacturer.

D. Coordinate work of this section with work of other sections to insure timely delivery and installation of work.

E. Design all systems for continuous 24 hour operation.

3.5 TEST AND VERIFICATION

A. General: The Contractor shall verify that all requirements of this specification are met. Verification shall be through a combination of analyses, inspections, demonstrations and tests, as described below.

B. Verification by Inspection: Verification by inspection includes examination of an item and the comparison of pertinent characteristics against the qualitative or quantitative standard set forth in the cited paragraph. Inspection may require moving or partially disassembling the item to accomplish the verification. Inspection shall be made of all equipment installations, proper functioning of all locking hardware and lock controls, mounting and wiring of electrical and signal distribution cabinets and components, and mounting and placement of sensors, cameras, etc. to ensure requirements of the specifications are complied with and that the overall installation is accomplished in a professional and workmanlike manner and in accordance with manufacturer’s written recommendations. The Owner's quality control representative(s) shall have full opportunity to witness the required inspections or to conduct his own inspections of the installation.

C. Verification by Test and Demonstration: The Contractor shall verify by formal demonstrations or tests that the requirements of this Specification have been met. All tests shall be documented and report of results submitted to the Engineer.

D. Test Verification Requirements: Paragraphs 1-3 below list specific requirements which shall be verified by formal demonstration/test. THE ENGINEER SHALL BE NOTIFIED IN WRITING THIRTY (30) DAYS IN ADVANCE OF ALL SYSTEM TESTS.

1. Factory Tests: Following factory engineering and assembly, the Contractor shall individually test each sensor and other components and verify the proper functioning of each component within a particular subsystem. Each subsystem shall be similarly tested until all detection zones, alarm assessment components, alarm reporting and display, and access control functions have been verified. Any deficiency pertaining to these requirements shall be corrected by the Contractor prior to shipment of the equipment to the project site.
    a. After fabrication, assembly and programming of the security electronics systems, perform tests of the integrated security electronics system, including duress alarm, access control, intercommunication, intercom, video surveillance, operator interface, and miscellaneous controls, with all functioning as a single, integrated system. Factory testing is a major milestone that shall commence only after all shop assembly, system integration, and software development is complete. Completion of the Factory testing is required prior to shipment of any system equipment to the site for installation.
    b. Each input and output point, operational sequence, touch screen display, operation of touch screen and control panel will be tested. Provide sample field devices, approved mock up devices and jumpers to simulate actual field operating conditions. In addition, simulated system failures, response time, boot up time and other tests will be conducted as directed.
    c. Conduct tests in strict accordance with an approved test procedure. Demonstrate full compliance with the required operating modes and sequences of operation. Record test results on a report that shall include a list of all personnel witnessing the tests, test methods used, and a record of each specific test made.
    d. The factory testing shall include all equipment and programming for the entire facility.
    e. Provide air transportation, car rental and lodging for Three Owner Representatives (3) and Engineer (1) to witness factory testing.
2. Preliminary Tests: Following installation, the Contractor shall individually test each sensor and other components and verify the proper functioning of each component within a particular subsystem. Each subsystem shall be similarly tested until all detection zones, alarm assessment components, alarm reporting and display, and access control functions have been verified. Any deficiency pertaining to these requirements shall be corrected by the Contractor prior to final functional and operational tests of the system. When subsystem verification is complete, the entire system shall be tested to assure that all elements are compatible and function properly as a complete system. All test forms showing testing results from the preliminary test shall be submitted prior to requesting the final demonstration testing.
3. Demonstration Upon Completion of Work: Upon successful completion of the System Validation Test, the Contractor shall schedule and request final completion demonstration and the Engineer notified. The request and notification shall include certification that the installation is complete and operable and has satisfactorily performed the final tests specified herein. The acceptance testing shall be accomplished in the company of the Engineer and the Owner's representative(s). The demonstration shall be structured so that all sensors and controls are stimulated directly in their installed and finally adjusted positions and all audible and visual displays, signals, alarms and other responses are demonstrated. A log of all demonstration activities and results shall be maintained by the Contractor. Original copies of this log shall be submitted to the Engineer within seven days of the demonstration.

E. Upon successful completion of the Demonstration Upon Completion of Work, the electronic security systems will be considered as substantially complete.

F. The Contractor shall carefully plan and coordinate the demonstrations so that all activities can be satisfactorily completed within eight (8) cumulative hours. The Contractor shall provide all necessary instruments, labor and materials required for demonstrations, the equipment manufacturer's technical representative, and qualified technicians in sufficient numbers to perform the demonstration within the time limits imposed by this Specification.

G. In the event that the Engineer are required to witness a retest at a later date because the Contractor is not adequately prepared to conduct the acceptance tests or because the systems being tested have failed such tests, which shall be solely determined by the Architect, the costs of witnessing additional tests (based on time and expenses at the established rates of the Engineer) shall be borne exclusively by the Contractor. In such an event, a change order to the General Construction Contract will be executed for compensation of the Engineer witnessing the tests.

3.6 SHAKEDOWN PERIOD

A. The Electronic Systems Integrator shall coordinate with the Contractor to establish a shakedown period for the electronic security systems. Shakedown period shall be a minimum of 7 days per completed area.

B. Initiation of Shakedown Period: Prior to initiation of shakedown period, all work related to and supporting the electronic security systems shall be substantially complete. Such work related shall include, but not be limited to the following:
   1. All electrical power circuits and interface points.
   2. All lighting in control locations.
   3. All environmental conditioning and control in control locations.
   4. All clean-up in control locations.
   5. All locking devices and sliding door devices operational.

C. During the shake down period the Electronic System Integrator shall provide all labor and materials to support operation of the facility by the Owner's staff.

D. The Electronic Systems Integrator shall maintain a log of all anomalies, malfunctions and repairs encountered during the shakedown period. The log shall be submitted to the Architect for assessment at the conclusion of the shakedown period.

E. Owner Training may be conducted during the Shakedown Period.

3.7 ADJUST AND CLEAN (SEE DIVISION 01)

A. Inspect all equipment and put in good working order.

B. Clean all exposed and concealed items.

C. Touch up paint where finish is damaged to original color and texture.

D. Clear debris from and vacuum clean the interior of all turrets, consoles, equipment cabinets and enclosures.

3.8 WIRING

A. All wiring within equipment: Point to point with appropriate terminal block connections for each wire and component termination.
   1. All connections mechanically secure.
   2. All terminations on terminal blocks.
   3. All terminal strips labeled to match submittal documents.

B. All cable and wire: As recommended by manufacturer of system, minimum as indicated in individual sections.
   1. Standard type available from multiple manufacturers.
   2. Replace cable determined to be inadequate for specified performance.
   3. All cable and wire shall be professionally labeled and tagged at each point of termination to match submittal documents.

C. Provide all wire and cable and perform all terminations. Check each cable system for opens, shorts, faults, or other discontinuities.

D. All wiring shall be color coded throughout.

E. Install all cable in conduit in accordance with other sections of these specifications. Minimum conduit size shall be 3/4 inch trade size. Size all conduit such that cable, wire and/or tubes do not to exceed 40 percent fill.

F. All wire and cables shall be installed continuous from field device to terminal point in equipment cabinet, enclosure or console. No splices or intermediate terminations will be allowed

G. All cables specified herein are based on indoor “dry” applications unless noted otherwise. Where actual construction conditions require cable other than indoor “dry” applications, provide suitable cable to meet performance requirements of the systems for which they the cable is to be provided.

3.9 OWNER PERSONNEL TRAINING (SEE DIVISION 01)

A. Provide training of operations and maintenance staff.
   1. Training shall be structured and developed to ensure proper understanding of systems to allow effective operation and maintenance of all systems in this Division of work.
   2. All training shall be conducted by professionals that are certified by the system manufacturer for the applicable equipment, software and integration.

B. Training shall be divided into multiple groups. Participants may attend multiple sessions.
   1. Control station operations
   2. System administration
   3. Maintenance

C. Conduct three (3) sessions for operational staff of duration of no less than four (4) hours each.

D. Conduct training sessions for maintenance staff, consisting of not less than three (3) sessions of four (4) hours. Maintenance staff shall participate in operational staff training prior to maintenance training.

E. Training shall be provided in a classroom environment at the facility and utilize installed equipment and systems to demonstrate operations and maintenance techniques.

F. Provide digital video recording of all training. Flash drive (FD) or some other media drives shall be playable on any consumer grade PC. Furnish four (4) copies of each FD to the owner with four (4) spare training manuals of each type. Provide electronic copies of training manuals in .pdf format. Provide four (4) FD copies of training manuals.
   1. Selected training shall be pre-recorded on FD in a classroom environment at the office of the integrator.
   2. Upon completion of the training at the project site, the Integrator shall update the training presentation based on feedback from the on-site training sessions and prepare final training FD for the facility.

G. No later than 120 days prior to anticipated initiation of training, the Integrator shall develop an outline of all training to be presented. The facility security administration will subsequently identify staff to participate in the training program. Based on this information the integrator shall prepare sufficient copies of training material to accommodate each participant.

H. See individual sections for specific training requirements.

I. Submittal of Training Documents:
   1. List of Trainers including copy of certification by the system manufacturers. (minimum 120 days prior to scheduled training session)
      a. Access Control System: Section 281300
      b. Video Management and Recording System Section 282300
      c. Electronic Control System: Section 284619
      d. Touch Screen Control and Management System: Section 284623
      e. Digital Intercom and Paging System: Section 285123
      f. Uninterruptible Power System: Section 285045
   2. Training outline and attendee sign up lists (minimum 120 days prior to scheduled training session).
   3. Training manual(s); one for each training group.(minimum 30 days prior to scheduled training session).
   4. Prerecorded training demonstration FD: one for each training group.(minimum 30 days prior to scheduled training session).

END OF SECTION

SECTION 280555

CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. General:
   1. Furnish all labor, materials, tools, equipment, and services for all cabinets and enclosures as indicated in accordance with provisions of Contract Documents.
   2. Completely coordinate with work of all other trades.
   3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
   4. See Division 1 for General Requirements.

B. Related work specified elsewhere:
   1. Common Work Results for Electronic Security: Section 280510
   2. Access Control System: Section 281300
   3. Video Management and Recording System Section 282300
   4. Electronic Control System: Section 284619
   5. Touch Screen Control and Management System: Section 284623
   6. Digital Intercom and Paging System: Section 285123

1.2 BASIS OF DESIGN

A. Cabinets and enclosures are provided for the protection and security of the equipment contained therein.

B. All cabinets and enclosures shall be rated for the environment in which they are installed unless noted otherwise.
   1. Type 1: Indoor use primarily to provide protection against contact with the enclosed equipment and against a limited amount of falling dirt.
   2. Type 3: Outdoor use to provide a degree of protection against windblown dust and windblown rain; undamaged by the formation of ice on the enclosure.
   3. Type 3R: Outdoor use to provide a degree of protection against windblown rain; undamaged by the formation of ice on the enclosure.
   4. Type 4: Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure.
   5. Type 4X: Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure, resists corrosion.
   6. Type 12: Indoor use to provide a degree of protection against dust, dirt, fiber flyings, dripping water, and condensation of non-corrosive liquids.

1.3 QUALITY ASSURANCE (SEE SECTION 28 0510)

A. Refer to NEC 312 for requirements associated with cabinets and enclosures.

1.4 SUBMITTALS (SEE SECTION 280510)

A. Cabinets and Enclosures:
   1. Project data: Layouts of all electronic equipment rooms including floor plans and wall elevations. NEC required working clearances shall be identified.
   2. Shop drawings: Assembly drawings of each control console arrangement including plan view, elevations, and sections.
   3. Product data: Technical data sheets and specifications for each component.
   4. Test results: Cabinet and enclosure temperatures.

1.5 WARRANTY (SEE SECTION 280510)

1.6 OPERATING AND MAINTENANCE DATA (SEE SECTION 280510)

PART 2 - PRODUCTS

2.1 GENERAL

A. Acceptable manufacturers:
   1. Enclosures and cabinets:
      a. Atlas Soundolier; www.atlassound.com
      b. Hoffman; www.hoffmanonline.com
      c. Middle Atlantic Products, Inc.; www.middleatlantic.com
      d. Panduit, INC; https://www.panduit.com
      e. Winsted; www.winsted.com
      f. Or equal
   2. Other manufacturers desiring approval comply with Division 01.

B. Systems:
   1. Provide complete coordinated consoles or groups of consoles as indicated on drawings.

2.2 EQUIPMENT CABINETS

A. Cabinets:
   1. Cold rolled steel units, 12 GA angles, 14 GA posts, 16 GA molding and braces.
   2. Doors: 16 GA flush mount; plain or louvered, flush pulls.
   3. Panels: 16 GA flush mount; plain or louvered, quick removal.
   4. Tall floor mounted units:
      a. Door control and Video Equipment Cabinets: Nominal 30 inches deep; 30 inches wide; 72 to 90 inches height; 24 inch EIA rack mounting frames. A manufacturer spacer section may be used on 24 inch wide units to obtain the additional wire/cable management space provided by this 30” inch wide requirement.

b. Intercom and Paging Equipment Cabinets: Nominal 30 inches deep; 24 inches wide; 72 to 90 inches height; 19 inch EIA rack mounting frames.

5. Provide flush full front door with key lock on all cabinets.
6. Provide flush full louvered rear door with key lock on cabinets with rear access. Provide flush full louvered panel on cabinets without access.
7. Provide ventilation grille at base of unit.
8. Provide ventilation fan where indicated on drawings or required to maintain manufacturer recommended equipment temperatures.
9. Provide square side panels for all base cabinets.
10. Provide 20A rated electrical power strip mounted in rear of cabinet to power 120 volt equipment. Where plug in power supplies are to be installed, install tie wrap around power supply and plug strip to prevent power supply from being accidently removed.
11. Provide blank plates by manufacturer to provide closure on all unused sections of units.
12. Finish: textured enamel from manufacturer's standard colors as selected by architect.
13. Model:
    a. Middle Atlantic DRK/WRK Series
    b. Or Equal

B. Provide 19” roll out rotating system in steel host enclosure for the cabinets without access from the rear side of the cabinets (cabinet against wall). Rotating design of rack allows enhanced access to rear equipment connections, simplifying wiring. Equipment and cable weight limitations must be observed.
   1. Middle Atlantic WR Series, or equal.

C. Provide 120VAC heavy duty, ball bearing, 100CFM minimum rear door or top mounted ventilation fan units where indicated on drawings or where required to maintain manufacturer recommended equipment temperatures. Install digital readout temperature gauge in each enclosure containing active electronic components. Position the temperature gauge’s thermostat wire away from ventilation fan, near the center of the enclosure to sense average ambient temperature. Test equipment for hot spots using digital IR thermometer to locate the ideal mounting location of the thermostat wire. Provide high temperature alarm contact and connect to electronic control system for annunciation on touch screen display.
   1. Ventilation fan unit: Lowell FW Series (or equivalent depending on manufacturer)
   2. Temperature gauge with thermostat: Johnson Controls A421 Series control and sensor

D. Furnish door alarm contact switch on each door where cabinets are installed in spaces other than dedicated electronic security equipment rooms. Connect wiring to electronic control system for annunciation on designated control panel or touch screen display.

2.3 WORKSTATION PC LOCKING ENCLOSURE WITH FORCED VENTILATION

A. Where noted on drawings, provide a lockable, forced ventilation, steel PC enclosure for each workstation. PC Keyboards shall remain locked in enclosure as well. Position enclosures so that intake vents and exhaust fans are not blocked. More than one PC may be located in the same enclosure if size and space available floor allow. Ensure sufficient quantity of fans are installed to maintain temperatures below the threshold. Fans shall be 115VAC ball bearing fans and not USB powered.
   1. Mier Products: BW-2XX Series, or equal.

2.4 EQUIPMENT ENCLOSURES

A. Provide wall mounted equipment enclosures where indicated on drawings.

B. Equipment enclosures shall be shall be provided with hinged door and key lock.

C. Furnish door alarm contact switch where enclosures are installed in spaces other than dedicated electronic security equipment rooms. Connect wiring to electronic control system for annunciation on designated control panel or touch screen display.

D. Provide 115VAC ball bearing enclosure fans and intake vents where indicated on drawings or where required to maintain manufacturer recommended equipment temperatures. Install digital readout temperature gauge in each enclosure containing active electronic components. Position the temperature gauge's thermostat wire away from ventilation fan, near the center of the enclosure to sense average ambient temperature. Test equipment for hot spots using digital IR thermometer to locate the ideal mounting location of the thermostat wire. Provide high temperature alarm contact and connect to electronic control system for annunciation on touch screen display.
   1. Ventilation fan unit: Hoffman HF Series (or equivalent depending on manufacturer)
   2. Temperature gauge with thermostat: Johnson Controls A421 Series control and sensor

2.5 FABRICATION:

A. Fabricate enclosures to easily accommodate interconnecting cables entering from above or below through the use of auxiliary gutters, cable trays, and conduits. Protect all metal cabinet edges where conductors cross and conduit ends with protective covering or bushing.

B. Group wires and cables by types, boards and modules, and maintain National Electrical Code clearances throughout the installation, including Class 1, Class 2, communications, and branch circuit power separations. Maintain sufficient and proper separation between microphone-level audio, line-level audio, high-level audio and video cables.

C. Uniformly organize equipment and cable routing throughout all enclosures, racks, and cabinets. Provide wiring ducts, wire ways, wire posts, D rings, wire saddles to route and secure factory and field wiring. Provide routing for all wiring from point of entry to point of termination to maintain required separation, access to all components, and general organization to the wiring. Neatly dress, route and secure wiring.

D. Mechanically fasten cabinet raceways and cable clamps to enclosure rear panels, rack members, console members, or to other system components. The use of adhesive fasteners (without mechanical fastener) is not permitted. Furnish and install cable support posts where necessary to properly support cables.

E. No splices are permitted in cabinet raceways. Exception: Splice to cable shield when within two inches of cable termination is permitted.

F. Furnish and install metal grounding type outlet strips in each equipment cabinet, enclosure, and rack. Leave a minimum of two unused receptacles at each location for future expansion. Neatly shorten and dress power cords from individual equipment to the outlet strips.

G. Provide protection from accidental contact of all terminals or exposed conductors over 25 volts within enclosures that contain Class 2 wiring. Use non-conductive barriers, heat shrink or other acceptable methods. Tape of any kind is not permitted.

H. Provide mounting rails as required for all equipment. Where applications of equipment with extended depth occur (i.e. UPS), provide internal mounting rails sufficient to allow doors to close, without contact with equipment and/or cabling.

2.6 SPARE PARTS (SEE SECTION 280500)

A. Deliver spare parts in protective wrapping and packaging for proper storage.

B. Provide the following spare parts:
   1. Fan unit: one of each type
   2. Thermostat: one of each type

PART 3 - EXECUTION

3.1 INSTALLATION (SEE SECTION 280510)

A. All equipment shall be mounted in cabinets and enclosures so as to provide ready accessibility for equipment and termination. All cabinets and enclosures shall be located to provide working clearance in front of accessible equipment as required by the National Electrical Code.

B. Provide wire/cable management throughout cabinets and enclosures. All wire/cable shall be physically supported within six (6) inches of termination.

C. Bracing: Brace or anchor all free-standing cabinets using Unistrut or other approved method to building structure.

D. Painting: Touch up all welds, scrapes and other mars in the enclosure finish with a rust inhibiting paint.

END OF SECTION

SECTION 281300

ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. General:
   1. Furnish all labor, materials, tools, equipment, and services for access control systems as indicated in accordance with provisions of Contract Documents.
   2. Completely coordinate with work of all other trades.
   3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
   4. See Division 1 for General Requirements.

B. Related work specified elsewhere:
   1. Common Work Results for Electronic Security: Section 280510
   2. Cabinets and Enclosures: Section 280555
   3. Video Management and Recording System Section 282300
   4. Electronic Control System: Section 284619
   5. Touch Screen Control and Management System: Section 284623
   6. UPS Section 285045

1.2 BASIS OF DESIGN

A. The purpose of the access control system is to allow a level of free movement within the facility for authorized staff. Movement through security barriers is accomplished by presentation of an access card to the card reader. Valid read shall cause the door to unlock and/or open. The authorization process is initiated at the access control system and validated by the electronic control system. The touch screen control system shall be capable of enabling or disabling the card reader function on detention doors.

B. The access control system will be a computer-based Building/Facility Management and Monitoring System used to control and monitor personnel and alarm activity. Access control panels (controllers) shall use fully distributed database architecture with real-time processing performed at each panel (controller). The fully distributed processing shall provide that all information (time, date, valid codes, access levels, etc) is downloaded to the controllers so that each controller makes its own access control decisions. There shall be no hierarchical or intermediate processors to make decisions for the controllers. Also access control system server/workstation shall not be required to make any decisions for the controllers including any global functions, providing instant response to card reads regardless of system size and provide for no degradation of system performance in the event of communication loss to the host (or actual loss of host). All time zones, access levels, linking events, holiday schedules, and global functions shall remain operational. Upon communication loss to the host all controllers shall automatically buffer event transactions until the host communications is restored, at which time the buffered events shall be automatically uploaded to the host. The system shall maintain full feature capability regardless of the style of the communications from the server.

C. The system shall be provided with a packaged software system for database and card management.

D. Provide interface with the fire access system (KNOX-BOX) at the gates indicated on the construction documents drawings. Following functions/operation have to be coordinated:
   1. All gates shall be electrically operated for entry and exit by a manner acceptable to the Fire Marshal.
      a. All gates shall be UL 325 compliant.
      b. Key override switch and Radio operated controller (Exception: Radio controlled exits may be waived by installation of a “free exit” loop.)
   2. Gates requiring radio-controlled exit activation shall be provided with an approved two (2) inch by two (2) inch blue, reflective marker visible to the exiting vehicle. It shall be located in the center of the exit gate.
   3. Electrically operated gates shall fail to the open position when the power is off. They shall remain open until power is restored.
   4. Access control gates shall have a clear width of not less than 20 feet.

1.1 QUALITY ASSURANCE (SEE SECTION 280500)

1.2 SUBMITTALS (SEE SECTION 280500)

A. Access Control System:
   1. Project data: Description of system operation indicating purpose and capabilities of each component of system with functional system diagram indicating all interfaces to other systems. Description shall include, and call attention to, all variances from the contract documents.
   2. Shop drawings: Complete installation drawings including system diagrams and terminal point to terminal point wiring diagrams or schedules.
   3. Product data: Technical data sheets and specifications for each and every component. (Including, computer, LAN, drivers and interface hardware component).
   4. Testing: Test reports of fiber optic cable installation (if applicable).

1.3 WARRANTY (SEE SECTION 280510)

1.4 OPERATING AND MAINTENANCE DATA (SEE SECTION 280510)

PART 2 - PRODUCTS

2.1 GENERAL

A. Acceptable manufacturers:
   1. Access Control System:
      a. C•CURE 9000 by Software House/Sensormatic Inc., Boca Raton, FL; Hirsch, Santa Ana, CA, Honeywell Access Control System (Win-Pak PE), IDentycard Access Control System (PremiSys) or **Brivo, Bethesda, MD (used in some Mono County buildings)**

2. Card Readers:
   a. HID
   b. Or Equal
3. Card readers wiring shall be provided per manufacturer's recommendation.
4. The product numbers contained herein are for reference only and may not be the most current available nor a complete listing of all features or options required. Where a manufacturer is listed without a product number, an equivalent item of the specified manufacturer is acceptable. Determination of equivalent is at the sole discretion of the Engineer. Where a conflict or ambiguity exists between the written description and the product number, the written description shall govern.
5. Access control products listed in this specification section are based on Software House and HID product numbers, performance and technical characteristics. Manufacturers listed in this spec section with products that have the same or better technical characteristics and performance will be acceptable.
6. Other manufacturers desiring approval comply with Division 1.

2.2 SYSTEM DESCRIPTION (ACCESS CONTROL SYSTEM- ACS)

A. The ACS shall be an integrated system that utilizes a single, industry-standard relational database management system for the storage and manipulation of related data. The ACS shall include a server with operating system and applications software, operator and administrator terminals with appropriate software, hard copy printers and fixed magnetic storage media. The security devices shall communicate with the field panels via a dedicated cable network. The field panels shall communicate to the server via a Fast Ethernet 100/1000, TCP/IP network.

B. The ACS shall allow for growth and scalability from a low-end or entry level system to a high end or enterprise system by increasing CPU power, memory and database. The ACS shall be modular in nature, allowing system capacities to be easily expanded without requiring major changes to system operation. All defined system data as well as historical information shall be maintained. Customizable user interfaces shall allow management of system information and activity for administrators and operators.

C. The ACS shall have a maximum capacity of:
   1. 2,500+ online readers
   2. 10,000+ online inputs
   3. 10,000+ online outputs
   4. 500,000 credentials
   5. 10 Simultaneous Clients (Additional clients may be added to the license up to 256)
   6. 2 Badging Clients (Additional clients may be added to the license)

D. The ACS shall support both application and web client connections. The system shall allow the user to define the number of administration/monitoring client connections. This prevents web clients from using these reserved connections.

E. System shall include but not be limited to the following:
   1. ACS Server
   2. ACS Workstations
   3. Badging/Enrollment Workstation, camera and printer
   4. Monitors for each computer
   5. Access Control Panels

6. Software.
7. Card Readers.
8. Request to Exit Devices
9. Communication/control devices as required for each system
10. Power Supplies.
11. Access Cards
12. Card Programmer (if needed to program cards/readers)

2.3 ACS FUNCTIONALITY

A. Partitioning

1. The ACS shall allow system administrators to separate the creation and viewing of objects into partitions. ACS operators shall be associated with partitions and this shall determine which objects operators have the ability to create and or view. The ACS shall support an unlimited number of partitions.
2. The ACS partitions shall include but not be limited to the following objects:
   a. Personnel
   b. Clearances
   c. Doors
   d. Controllers with all associated hardware (readers, inputs, outputs, etc)
   e. Application layouts
   f. Events
   g. Dynamic views
   h. Maps
   i. Reports, forms, results
   j. Holidays
   k. Badge layouts
   l. Queries
   m. Images
3. Through the use of privileges, the ACS System Administrator shall be able to determine which objects are associated with a particular partition. These objects shall then be assigned to System Operators with the appropriate privilege.
4. The ACS shall support a super-user assigned the ‘System All’ privilege who shall have full access to all objects in all partitions.
5. Any operator shall have the ability to be assigned access rights to any partition. Individual Access rights shall be created and have the ability to be assigned to any users of the ACS.
6. The ACS shall allow objects to be created in any partition. The ACS shall have the ability to grant or remove permission from any object in any partition.
7. The ACS shall provide the ability to move objects from one partition to another partition without the requirement of deleting and recreating.
8. The ACS shall provide the ability to import/export any configured object.
9. The ACS shall support the display of all associated objects contained within a partition.

B. Graphical User Interface (GUI)

1. The ACS shall employ a standard Windows graphical user interface (GUI). A mouse and keyboard shall be the primary operator interface with the system. Operator screens shall utilize all standard Windows-style functions such as drop-down menus, context menus, radio buttons, and lists, as appropriate. The interface shall utilize a ‘tree structure’ similar to Windows Explorer.

C. Administration Operator Interface
   1. The ACS shall employ an Administration Operator Interface to control the following:
      a. Hardware (readers, inputs, outputs, door controls, and other systems).
      b. Configuration of personnel records, operators and operator privileges.
      c. Graphical Maps.
      d. Application Layouts.
      e. Dynamic Views.
      f. Queries.
      g. Import/Export of objects, including images.
      h. System Variables.
      i. Reports (either periodic or one-time).
      j. System functions (event command and control, actions, schedules).
      k. Display of a list of objects in a grid that can have their values modified and respond to real-time status changes.
      l. Scheduling of backups.
      m. Monitoring of system settings and performance.
      n. Designing of and printing of badges.
   2. The GUI shall be configurable by the system administrator to control the views and access of each Monitoring Station operator.

D. Monitoring Operator Interface / Activity Monitoring
   1. The ACS shall contain a monitoring component that is capable of, among other things, displaying the current state of any object in the system. Additionally the monitoring station shall be capable of displaying a log of all activity that occurs in the system, from object state changes, to access control information. All text for events (alarms) in the system shall be configurable to be displayed in color based on the user-specified priority of the event.
   2. The Monitoring Station shall be capable of showing all changes occurring to an object without requiring the associated activity messages for that object to be routed to that monitoring station. The ACS shall require the operator to have appropriate permissions to view and/or control any object.
   3. The monitoring station interface shall be user-customizable. The ACS shall support the ability of the end user to create a customized application layout for the monitoring station. The monitoring station shall support multiple application layouts that can be assigned to the operators. Each application layout can have multiple panes in the same window. The panes can have multiple tabs so that different objects such as cameras and tours can be displayed in the same pane. The panes shall have the ability to include: General activity; Event (Alarm) activity; Dynamic card swipe information; Maps; Dynamic Views; Reports; and links to external applications. Each pane shall have the ability to be moved to a specific screen.
   4. The ACS shall support the ability to configure an Operator's Application Layouts to open in separate instances of the Monitoring Station to enhance the performance of multiple displays. Each Application Layout shall support the assignment of a monitor number. The Operator opening the Monitoring Application shall automatically open a separate instance of the Monitoring Application on each assigned Monitor. The ACS shall support up to Ten (10) assigned monitors for Application Layouts.
   5. The ACS shall provide the Monitoring Operator with following functional capabilities:
      a. Shall provide a scrolling list of lines or tiles showing current activity on the system.
      b. Shall display activity in real-time as data is being transmitted by field hardware.
      c. Shall include icons that indicate the type of activity and textual description of the activity.

d. The color of the frames of the tiles, icons, and/or text shall indicate the type or importance of the information contained therein.
e. A series of menus, driven by drop-down or trees, shall allow the Monitoring Station operator to perform manual actions, such as “momentary door unlock” for a given door.
f. As part of the manual action capability, the system shall provide screens or boxes that query the operator on specifics, such as start and end time, and offer guidance on performing the manual actions.
g. A GUI that displays the images of personnel as they enter, as well as the stored images of personnel available in the ACS.
h. Ability to view a sortable list of active alarms or events and recently active alarms or activity.
i. A GUI that minimizes the number of operator mouse clicks or keyboard strokes.
j. Mouse controls include “right-click” pop-ups and highlighted default selections.
k. Objects shall be displayed to the operator based on his/her assigned operator privilege. The operator shall only be able to monitor/command those objects for which he or she has been assigned privilege.
l. When an operator logs out of a workstation and a new operator logs on, the objects displayed on the workstation screen shall by dynamically updated to display only those objects for which the new operator has privilege.
m. Allow the customization of columns as defined by the operator privilege, including:
    1) Adjusting width (on the fly or pre-programmed).
    2) Not displaying Columns (on the fly or pre-programmed).
    3) Sorting on selected columns (to follow standard Windows conventions).
n. Allow for a “freeze” function. This includes a configurable “freeze time-out” that permits an activity to be selected and temporarily prevents the display of subsequent activities which push the selected activity off the screen. A break-through event disables the freeze function. The freeze function shall provide a graphic bar where the remaining time available in the freeze timeout shall be displayed. Selecting the freeze timeout icon before the time elapses shall extend the freeze timeout to the maximum.
o. Provide Acknowledge All, Acknowledge and Clear All and Silence All buttons for events.
p. Support multiple panes for the display of events, activities, video, personnel images, and maps.
q. Display the number of active causes of an event.
r. Support the ability to attach a log message to an event, even after the event has been acknowledged.
s. Provide the ability to attach Predefined Log Messages to an event upon acknowledgement.

6. Pre-defined Alarm Acknowledgement Messages
    a. The ACS shall provide the ability to create Predefined Log Messages. Each log message shall have a Name, Description, Label and Message Text. These messages shall be assigned to any event providing the ability to select the appropriate response that resolved the event. The ACS shall provide the ability to group multiple log messages and then assign the group to an event. Each group shall contain up to one hundred messages and each event shall support up to one hundred messages. The ACS shall allow only users with specified operator privileges to add, modify, or delete messages or message groups. Predefined messages shall be editable by an operator with the proper privilege and may be appended as required by the operator.
7. Messages shall have the following characteristics:

a. Message Name shall be configured with up to 500 characters
b. Message Description shall be configured with up to 500 characters
c. Message Label shall be configured with up to 100 characters
d. Message Text shall be configured with up to 3000 characters

8. The ACS shall support audible alarm annunciation at operator workstations (operator configurable audio [WAV] files associated with alarms).
9. The activity monitoring screen shall be capable of displaying the following features:
   a. System clock.
   b. Date/time when the activity actually occurred and the date/time when the activity was received by the server shall be displayed (when they are different).
   c. Real time event counters.
   d. Count of the active events.
   e. Count of the events requiring operator acknowledgment.
   f. Name of operator logged on at the workstation.
   g. Real-time display of the current activity on the system in chronological order.
   h. Acknowledge All and Silence All buttons for events.
   i. Manual Action command buttons.
   j. Pre-defined and configurable acknowledgement messages.
   k. Log message.
   l. Clear event.
   m. Clear group of events.
   n. Event action message (automatically display selected message for event).
   o. Dynamic views.

E. Web Client
1. The ACS shall support a Thin Client to provide remote access to the ACS Server via a web browser. The Thin Client shall support Microsoft® Internet Explorer 7.0 and Mozilla Firefox® 3.0 or greater. The Thin Client shall support 128-bit AES encryption to the ACS Server.
2. The Thin Client shall support Single Sign-on utilizing Windows Authentication. The privileges of the ACS operator shall be propagated to the Thin Client User allowing only access to Security Objects for which the ACS Operator is authorized. The Thin Client shall provide support for Partitioning of the system and utilize the Partitions assigned to the Operator.
3. All changes made to the ACS database via the Thin Client shall be recorded in the Audit Trail Database.
4. The Thin Client shall provide Personnel Management including:
   a. Shall allow the operator to create and modify personnel data (includes adding/removing clearances, schedules, and expiration dates).
   b. Operator shall have the ability to enable and disable cards.
   c. Operator shall have the ability to search for, edit, add, and delete Personnel records from the ACS database.
   d. Search function shall allow wildcards and shall include First name, Last name, card number, and user defined text.
   e. Shall support for the Auto-increment Card Number feature for Credentials created using the Web Client.
   f. ACS thin client shall provide a personnel image tab that includes image display, Image capture from a file or a local USB camera, and the capability to crop the Image and save it to the ACS personnel record.
5. The Thin Client shall support an Activity Monitor to provide a scrolling display of system activity. Activity shall be restricted based upon the Operator's Privilege and Partition assignments. Display controls shall include page up, page down, and a freeze function.

6. The Thin Client shall support acknowledgement of an Event from the Event Dynamic View.
7. The Thin Client shall support for logging an Event Message from the Event Dynamic View
8. The Thin Client shall support Manual Actions to include the Locking/unlocking of doors, and the Activation/deactivation of events.
9. The Thin Client shall support the display of Dynamic Views as defined by the ACS. Dynamic Views shall provide a real time view of ACS data including Journal and Audit Trail history. Viewing of Multiple Dynamic Views shall be supported.
10. The Thin Client shall support creating, configuring, loading and saving of reports. Reports shall consist of personnel history activity or audit data. The report data shall allow sorting within the thin Client view page by any displayed field in ascending or descending order. The Thin Client shall allow reports to be saved in the following formats: XLS, CSV, XML, TXT or PDF. The operator shall have the option to save the report to a file or send it via email.
11. The Thin Client shall support Manual Action Challenges. The Manual Action Challenge shall require an operator to enter their login credentials (User name and password) when executing a manual action, such as a door unlock, from within the Thin client.
12. The Thin Client shall support the ability to query on a specific cardholder or a group of cardholders for the purpose of assigning clearances to multiple cardholders at once. Once the query is complete, the operator shall have the ability to assign a single access clearance or a group of clearances to all cardholders.
13. The Thin Client shall support the ability to display a door activity report from the web client cardholder record configuration view. In addition, it shall provide the ability to display the Activation / Expiration Date and Time for each credential assigned to a cardholder. The thin client shall display all user-defined personnel fields and the details of each assigned access clearance in a separate window.
14. The Thin Client shall support Auto-Logoff based upon inactivity. The Thin Client shall monitor user activity and shall automatically log a user out of the workstation after a user defined timeout period.
15. The Thin Client shall support the ability to assign or remove clearances to multiple cardholders simultaneously.

F. ACS Mobile Application

1. The ACS shall support a Mobile Application allowing operators to monitor or administer the ACS system by way of mobile device. The device shall be connected via the phone network and a VPN or via Wi-Fi to the ACS server utilizing Web Service (IIS - Web Service).
2. The ACS Mobile software shall be available for download from the following locations:
   a. Apple App Store
   b. Google Play
3. The Mobile Application shall support mobile phones and tablets running the following operating systems:
   a. Apple iOS 7.0 and higher (iPhone, iPad, iPod Touch)
   b. Android OS 4.0 and higher
4. The Mobile Application shall connect to a standalone ACS server, including an Enterprise Satellite Application Server (SAS) and –a Site Server (Appliance).
5. The ACS Mobile Application shall support connection to the ACS system through a 3G (minimum), 4G, or Wi-Fi connection.
6. The number of mobile connections allowed by the ACS server shall be based on the ACS licensing model. Each connection made through the ACS Web service shall be considered a simultaneous client connection.

7. Operator login to the ACS Mobile Application shall be consistent with the ACS thick client application, authenticating login credentials via Windows Single Sign-On (SSO).
8. The ACS Web Service shall require Internet Information Services (IIS) be installed on the target system. The ACS Web Service shall be installed on the IIS server during installation.
9. The ACS Mobile Application shall support SSL-encrypted communications with the remote Mobile Web Service.
10. The ACS Mobile Application shall provide a search and filter option to refine query results.
11. The ACS Mobile Application shall provide a link to a context menu while viewing objects, providing the operator the ability to perform ACS operations consistent with the ACS administration and monitoring applications.
12. The ACS Mobile Application shall provide the following core features:
    a. The ACS Mobile Application shall provide operators with the appropriate privilege, access to tools used for inspecting the ACS Journal and Audit Logs.
    b. The ACS Mobile Application shall provide a collection of tools to monitor ACS events and other objects. Monitoring shall show active ACS events in real time.
    c. The ACS Mobile Application shall provide a collection of tools to manage personnel and shall allow for the following:
        1) Create/Update Personnel Records
        2) Assign/Remove a card/credential to personnel.
        3) Capture an image and associate that image with personnel.
        4) Grace personnel, Antipassback Card Reset, Area Lockout Grace, and remove personnel from an Area
13. The ACS Mobile Application shall provide tools used to explore, edit and control the following objects:
    a. Favorite Filters
    b. Favorite Monitors
    c. Query
    d. Events
    e. Manual Actions
    f. Operators
    g. Controllers
    h. Doors
    i. Elevators
    j. Inputs
    k. iSTAR Clusters
    l. Outputs
    m. Readers
14. The ACS Mobile Application shall provide an editor for local application preferences such as:
    a. Login Parameters – Encryption, Inactivity Timer, etc.
    b. Data Collection – Page Size
    c. Monitoring – Polling Intervals, etc.

G. Graphic Maps
1. The ACS shall support unlimited graphic maps and icons to be displayed on the operator workstation monitor.
2. The system shall support an operator-programmable, color graphic map display that:
    a. Shall be capable of showing the floor plan, the location of alarm devices, and alarm instructions for a facility.
    b. Shall be centralized in the system configuration and displayed on the operators' workstations.

c. Shall allow various maps to be associated with different areas to create a hierarchy of maps.
d. Shall support graphic maps having a resolution of 1024x768 Pixels or greater.

3. The ACS shall allow the addition of new layers to the drawing (such that if the drawing must ever be reloaded due to an update of the drawing, the layer(s) created within the ACS will be added back automatically without additional reconfiguration).
4. The ACS shall be able to directly import the following file formats for the map:
   a. AutoCAD (.DWG)
   b. DXF
   c. JPEG (.JPG)
   d. PNG
5. The Maps feature shall include two operational modes: an administrative mode to allow configuring of the facility floor plans or site plans that show exterior features and a runtime mode to allow monitoring and interacting with the configured facility layouts or site plans.

H. Information Storage, Backup and Transfer
1. All programmed information, as well as transactional history, shall be automatically stored in the database for later retrieval and backup. The ACS shall support configurations where the ACS database(s) may be installed on a hard drive on the ACS server, on an independent database server, or in an existing corporate database server.
2. The ACS shall be capable of backing up and restoring all system data and transactional history. The server shall be capable of transferring all programmed data and transactional history to CD-ROM, DVD, or Hard Drive (including networked drives).
3. The ACS shall allow activity history to be written to a database. The system shall have the capacity to store a minimum of 50 million transactions. There shall be a method of backing up the activity history on external media and then restoring and replaying it.
4. The ACS shall support AES 256-bit encrypted communications between server and user client.
5. The ACS shall support AES 256-bit encrypted communications between server and controller. The encryption shall support both local and third-party digital certificates.

I. Communication Ports
1. The ACS shall be able to support multiple serial devices. In addition to COM1 and COM2, up to [8, 16, 32, to 256] additional ports may be configured through the use of a port expander or its equivalent.
2. The ACS shall support the use of Ethernet networks as the communications path between the host computer and field devices such as, iSTAR, apC, apC 8/x, ApC Lite controllers, and Video Management and Recording System. This communications path shall be the same network used for communications between the host server and the operator workstations. The communications between the host computer and the field devices shall be encapsulated in a TCP/IP network/transport layer.

J. Printers
1. The ACS shall support report printing. The report printer(s) may be connected directly to the client PC, or shared over a network. The ACS shall support as report printer(s) any printer for which a printer driver exists within the Windows 7, Windows 8.1 and Windows Server 2008 operating systems.

K. Software Configuration
1. The ACS configuration tools shall utilize intelligent configuration controls. The system shall be structured so an operator is unable to perform configuration functions that are invalid based on the configuration used. The system shall support the ability to search within

browser lists using filtering operators such as “begins with”, “ends with”, “contains”, etc. The system shall also allow an operator to do searches using filtering operators on any class of object in the system, both in the Administration application and the Monitoring Station application.

2. The ACS shall allow text description of all configured objects. The ACS shall allow the renaming of an existing title description without removing the sub-components of that configuration object. The ACS shall automatically remove from the system all configuration references to an object being deleted. The ACS shall automatically provide default names for all inputs, outputs, readers, and extension boards. The ACS shall clearly display which hardware objects (inputs, outputs, readers) on a controller are configured, and which are not.
3. The ACS shall provide for the configuration of templates. Templates of supported objects shall be operator-configurable to provide default values for data fields within an object class’s configuration.
4. The ACS shall support an unlimited number of groups for any object type. The ACS shall support unlimited object group definitions. In general, a group shall be usable wherever an individual object is referenced in the ACS. For example, a group may be used instead of an object when configuring a schedule/object pair in a clearance, and a group may be used instead of an object when performing a manual action to unlock a door.
5. The ACS shall generally allow any object in the system to be grouped including personnel, doors, inputs, outputs and clearances.
6. The ACS shall restrict the viewing and controlling of objects in the administration and monitoring stations via operator privileges. The ACS shall support the configuration of operator restrictions on an object class basis, and on an object-by-object basis. The ACS shall maintain a distinction between objects that are being monitored and objects that are being controlled, preventing operators from issuing object manual actions to objects for which the operator does not have manual action privileges. There shall be different levels of controls within the system for administration privileges versus monitoring privileges.
7. The ACS shall support unlimited operator accounts with unlimited definable privilege levels.
8. The ACS shall allow configuration of controllers using hierarchical tree-based navigation and context menus.
9. The ACS shall support the ability to download firmware updates to the controllers.
10. The ACS shall support Windows single sign-on (SSO) that integrates login credentials with operator permissions to provide seamless user authentication and authorization.
11. The ACS shall provide an automatic client update process for quick distribution of application updates.
12. The ACS shall have context sensitive online help (at the screen level) available at any point requiring operator input.

L. Personnel Records

1. The ACS Personnel records shall provide multiple tabbed pages of personnel data containing default system and user-defined fields. The ACS shall support an unlimited number of tabs allowing an unlimited number of user-defined fields. Labels for user-defined field tabs shall be customizable by the System Administrator with the appropriate privileges. Each user-defined field shall allow a name, description and label. A default language shall be selectable by the System Administrator for the user-defined field labels.
2. User-defined fields shall be definable as Mandatory or Unique and shall support the following field types:
   a. Character
   b. Integer
   c. Logical

d. Date/Time
e. Date
f. Time
g. Enumerated List
h. Multi Line
i. Decimal
j. Identity

3. User-defined fields shall support masking to provide consistency of data entry across all system operators. Custom masks, as well as the following predefined masks, shall be available:
   a. Alphabetic
   b. Alphanumeric
   c. Numeric
   d. Phone Number – USA
   e. Zip Code
   f. Alpha – All Caps
   g. Alpha – All Lower case
4. The ACS shall provide a “Personnel Record Document Object” option which allows the operator to assign / attach up to two (2) documents (such as URL, PDF, or TXT files) to the personnel record. The document may be applied to the record as a:
   a. 'Shared' Document - added to the ACS via the Documents Editor.
   b. 'Private' Document - imported from outside the system, such as a birth certificate or a diploma.
5. The ACS shall include a "Documents" tab to user-defined personnel views as well as the default view "Personnel View with Portrait in Header" to support the association of documents. The documents are available for viewing by operators with appropriate privilege.
6. The ACS shall support the generation of a unique random card number for an access credential for all Personnel records. The unique card number shall contain up to the maximum number of digits for the CHUID format chosen for the credential.
7. The ACS shall support a system-wide setting to automatically disable Personnel Credentials that have not been used for a specified period of time. The Disable by Inactivity process shall support a user configurable daily scan time.
8. The ACS shall support the configuration of a trigger for a Personnel record that pulses an Event whenever a 'Card Admitted'/'Card Rejected' message is logged to the Journal for that person at a defined Door/Elevator.
9. The ACS shall support an email address field and shall support the sending of emails to Personnel Groups.

M. Personnel Views
   1. The ACS shall support user-defined Personnel Views. Personnel Views shall provide the ability to customize the Personnel record by adding and/or removing certain objects from the operator’s view. Personnel Views shall be assignable to ACS operators via the operator’s assigned privilege and shall be definable for use in the creation and/or editing of the Personnel record. All Personnel Views enabled for an operator shall be selectable from the current view to allow an operator to switch views in real time. Personnel Views shall support the following:
      a. Adding/Removing Fields (including all user-defined fields)
      b. Custom Field Labels
      c. Adding Boxes to group together common fields
      d. Adding/Removing tabs to organize fields

e. Custom Tab Labels
f. Customization of Tab display order
g. Background/Foreground color control of fields and labels
h. Personnel Record Document Object – to associate up to two (2) documents to the record

N. Inputs/Outputs
1. The ACS shall monitor both supervised and unsupervised hardware inputs as well as virtual inputs such as predefined system messages. These inputs include door / elevator inputs and monitor points. The ACS shall also monitor controller inputs such as tamper, AC fail, and low battery.
2. The ACS shall have the ability to name and allow for user-defined descriptions for individual inputs, outputs, and readers as well as input and output modules.
3. There shall be three separate and distinct states for inputs, which can be defined on the input configuration screen: Disabled, Enabled / Disarmed and Enabled / Armed.
4. The ACS shall allow configuration to link the state of an input to an output. The system shall allow multiple inputs to activate a single output or group of outputs.
5. The ACS shall have outputs, also known as Control points that associate an input or event action with a relay output. These output uses include doors / elevators, alarms and industrial control.
6. There shall be three types of outputs available: dry contact / Form C relays, wet or voltage sourced relays and Open Collectors. Outputs shall be configured such that they can be activated, deactivated or pulsed by system actions.

O. Card and Reader Support
1. The ACS shall be designed to support multiple card formats and card reader types.
2. The ACS shall support the following features for directly connected readers:
a. User defined card formats up to 256 bits.
b. Unlimited number of ACS card formats.
c. The ability to assign up to 10 card formats per reader.
d. The ability to show reader status on RM LCD.
e. Support Wiegand and 3x4 matrix keypads.
f. The enrollment of biometric templates to smartcards.
g. Custom CHUID FIPS201-compliant supporting full 256-bit data.
h. The ACS shall support readers that provide Wiegand signaling and magnetic signaling to include:
1) Software House RM readers.
2) Software House Multi-technology readers.
3) Wiegand swipe/insert readers.
4) Proximity readers.
5) Biometric readers.
6) Smart card readers.
7) Wireless readers.
8) Magnetic readers.

P. Advanced Door Monitoring
1. The ACS shall support Advanced Door Monitoring allowing additional monitoring inputs and lock sensing equipment at all doors. Advanced Door Monitoring shall allow integration with third-party lock release inputs, such as fire and crash bar devices, that control emergency egress.
2. Advanced Door Monitoring shall include:
a. Multiple inputs – Advanced Doors shall support up to 16 inputs.

b. Single and double-leaf doors with multiple DSM or Request To Exit (RTE) inputs.
c. Shall support Lock sensing devices – to monitor locking on magnetic bonds, bolts, and cams.
d. Integrated lock releases – to integrate door unlocking with fire, crash bar, power fail, and key switch inputs.
e. Special events and actions – to create keypad commands that lock, unlock, and secure doors for a specific time period.
f. Alarm Suppression and RTE control on a per door basis.
g. Enhanced Shunt control.
h. Grace and change timing options – to fine tune the ACS timing to avoid the effects of 'door bounce'.
i. Journal reports and Monitor Station activities – to manage the system and monitor door activity.
j. Additional Event Actions related to Advanced Doors

Q. Keypad Commands
1. The ACS shall support keypad commands. Keypad commands shall be up to Nine digits in length. Keypad commands shall be entered at a keypad connected to an iSTAR controller and shall be used to activate system events. The event shall be configurable to activate any allowable event action.
2. Keypad Commands shall support Personnel Permission options to accompany the command and validate the issuer's identity. Keypad Commands shall be configurable to require a valid credential or a valid credential plus a PIN. Keypad Commands shall also be available to all Personnel or only selected Personnel as part of a Personnel Group.
3. The ACS shall support the assignment of certain users as Keypad Command Administrators. These users shall be able to issue all Keypad Commands and shall not be required to be part of a Personnel Group assigned to a Keypad Command.
4. Keypad commands shall have the ability to be limited to specific doors as part of a Door Group within an iSTAR Cluster. In addition, specific readers shall be configured to allow or disallow keypad commands.
5. Keypad Commands shall support segmentation of the nine-digit code in the form of Prompt Codes. Prompt Codes shall allow the user to utilize some digits of the Keypad Command to correspond to a command such as a door unlock, and the remaining digits to correspond to an object such as a door. When using Prompt Codes, the first segment shall be entered and the ACS shall prompt the user on the reader LCD module to enter the remaining digits. The ACS shall support two Prompt Codes per keypad command.

R. RM Reader LCD Messages
1. The ACS shall provide custom LCD messages to be displayed on the LCD screen of RM readers. All messages, as well as date and time formats, shall be downloaded to the controller and will be used on all supported readers configured on that panel. The ability for the System Administrator to change the Language for LCD messages shall be provided. (The reader LCD supports Western character sets only. No double-byte languages are supported.)

S. Door Configurations / Elevator Control
1. The ACS shall allow doors to be configured to operate in any of the following access control modes:
a. Unlocked
b. No Access (Secure mode)
c. Any combination of the following, as defined by schedule, event: card only, PIN only, Card + PIN, Card entry through keypad.

2. The ACS shall allow a door to be configured to operate using the following functions:
   a. Readers shall read cards while the door is in the open position.
   b. Door lock relay shall automatically lock upon the door being opened.
   c. Allow for a user-defined delay relock time period.
   d. Allow for a user-defined door unlock time and door held open time.
   e. A separate (alternate) shunt timer for ADA flagged cardholders
   f. The operator shall be able to specify a shunt expiration output to be triggered for a configurable time (in hh:mm:ss) before the expiration of the door open or alternate shunt. Can be enabled for ADA only, or all the time.
   g. Allow for a user-defined door unlock and door held time, in seconds.
   h. PIN-only access (keypad).
   i. PIN-entry on the reader keypad shall be required during a specified schedule after a card access (unless a manual action or event has disabled PIN).
   j. Card entry through keypad.
3. The ACS shall allow each door to be configured to cause a variety of events such as alarms to occur based on activity at that door.
4. The ACS shall support configuration of unlimited elevators.
5. The ACS shall support an extended unlock function initiated via two valid card presentations to a single reader or a 'double swipe'. The double swipe feature provides the ability to designate doors at which cardholders with double swipe privileges may perform an extended lock or unlock of the door. The double swipe feature shall support the following:
   a. Modified reader beeper pattern to reflect the extended unlock mode.
   b. Individual card access privileges to perform double swipe action.
   c. Unique parameters assignable to any door.
   d. Reset of a double swipe unlock (relock) via scheduled event.
   e. Event activation to reflect double swipe state (Lock, Unlock).

T. Area Control and Antipassback
1. The ACS shall support the ability to define Area configurations. Areas are defined as physical regions bounded by doors. An area shall consist of a room, a specific location(s) within a building, or an entire building
2. All configured areas shall have in/out access doors providing the ability to run reports showing all present cardholders in each area. There shall be no way to leave an area without presenting a credential to a reader/door.
3. The ACS shall support Global Antipassback and shall allow an area to be configured to cross multiple clusters (groups of controllers) to enforce Global Antipassback decisions.
4. The ACS shall provide the ability to run a Roll Call report. The host shall maintain a current area for each personnel record, and the time at which the area was entered (AreaAccessTime).The current area shall represent the last area entered by the cardholder based on a valid admit.
5. The ACS shall support Area control to provide the ability for tracking personnel. With this function, an operator shall obtain the current location of cardholders. Dynamic views and or reports can be generated to show specific cardholders who are present in each defined area.
6. Each cardholder's record shall provide easy access to view and maintain their current area location. This card record property will be updated as a person moves from one area to another using a valid credential.
7. The ACS shall support the configuration of an area as a Mustering area. A Mustering area is an area where Personnel gather in an emergency. A Roll Call report shall be supported for the tracking of Personnel present during an emergency. The ACS shall also support

the definition of a De-Mustering area. The De-Mustering area shall be used to place all Personnel in a neutral area to accurately track Personnel as they re-enter a facility.

8. The local controller shall provide the ability to manage and control the Area configuration in the event that it loses communication with the ACS system server.
9. The ACS Area configuration shall have three modes of operations: None, Antipassback, and Timed Antipassback.
10. Antipassback shall control access based on the cardholder's location. The ACS shall deny access to cardholders who are in violation of antipassback rules. In the event that a cardholder leaves an area without presenting their credential to the out access reader/door and then tries to enter back into the area by swiping the In access reader/door, a denial of access will occur. The ACS shall provide the ability to grace individual cardholders who have violated antipassback rules. The Grace option shall also provide the ability to grace all cardholders.
11. Antipassback shall continue to be enforced during communications failure. ACS controllers shall have the ability to be clustered in a group. The master controller in the group and all other controllers within that group shall have full access to the existing antipassback information. The cluster can be configured for 'No Access' Communications Failure mode or for 'Local' Communications Failure mode.
12. Clustered controllers configured in 'Local' mode that are disconnected from the master controller shall grace all cardholders from antipassback violations. The disconnected controller shall then follow antipassback rules specific to the areas defined on that controller. If the controller does not know if a cardholder is in antipassback violation based on areas that are configured between controllers, access will be granted.
13. Clustered controllers configured in 'No Access' mode that are disconnected from the master controller mode shall not grace all cardholders from antipassback violations. All cardholders will receive a denial of access until communications is restored.
14. The ACS shall support Timed Antipassback. Areas configured for Timed Antipassback shall require a cardholder use an exit reader to exit an area. Cardholders who do not exit properly shall be required to wait for a predetermined period of time before re-entering the area.
15. The ACS shall provide occupancy restrictions for areas. Restrictions shall be applied to individual cardholders (personnel) or user defined groups of cardholders. Areas shall be configurable to provide limits for the maximum and minimum number of personnel who can access an area at one time. It shall be possible to trigger an event based upon a violation of either of these rules. Events shall be configurable based upon the following criteria:
    a. Maximum occupancy status
    b. Minimum occupancy status
    c. Group Maximum occupancy status
    d. Group Minimum occupancy status
    e. Personnel Count (user-defined)
    f. Violation status (Antipassback entry/exit violation etc.)
16. The ACS shall support Soft occupancy restrictions for both maximum and minimum occupancy to allow reporting of violations while still allowing access to the area.
17. The ACS shall support Area Lockout. Area Lockout shall restrict or lockout certain cardholders from an area once they have accessed another area. The cardholder shall be locked out of the designated target Area or Group of Areas for a specified period of time. The maximum time period for lockout shall be five (5) days. The target locked-out Area shall be any of the following:
    a. Same Area
    b. Another Area

c. Area group

18. The ACS shall allow a System Operator with the appropriate privileges to cancel the lockout time (lockout grace) for all or individual cardholders, thereby canceling the area lockout.

U. Escorted Access

1. The ACS shall provide an Escorted Access feature that gives the ability to control, track, and report on the movements of Personnel designated as Escorted Visitors. An Escorted Visitor shall be a visitor who can only move around a facility in tandem with an employee designated as an Escort.
2. There shall be two Escort Visitor modes: Companion mode and Remote Escort Mode. In Companion mode the system shall allow multiple Escorted Visitors to be accompanied by one escort. In Remote Escort mode the system shall allow Escorted Visitors and the Escort to present their credentials on opposite sides of a door to gain access.
3. The ACS shall have the ability to configure a designated Area to allow an Escorted Visitor to enter/exit the area without an Escort.

V. Intrusion Zones

1. The ACS shall support the configuration of Intrusion Zones. An Intrusion Zone is a user-defined group of Doors and Inputs on the same local Controller that delineates a physical area. This area shall be monitored and produce an alarm during any violation of the objects associated with the Zone.
2. The local controller shall provide the ability to manage and control the Intrusion Zone in the event that it loses communication with the ACS system server.
3. The Intrusion Zone shall have 2 modes of operations: Armed or Disarmed. When an Intrusion Zone is in an armed mode, the state of the Intrusion Zone shall either be Violated or Not Violated based on the state of the inputs and doors associated with the Zone. If the Zone is violated the ACS shall provide the ability to execute any defined event(s) within the ACS.
4. The ACS shall provide the ability to display the “Ready to Arm State” of any configured Zone. The “Ready to Arm State” shall be able to be displayed from any ACS monitoring application or from a local reader with an LCD display. All off-normal points/doors shall be able to be displayed from both locations. If any point or door associated with a Zone is not in a normal state, the Zone shall show a “Not Ready to Arm State”.
5. When a door is placed in a Zone, the operation of the door shall be configured based on the state of the Zone (unlocked, locked, secure). Specific doors assigned to the Intrusion Zone shall be configured as entrance or exit points for the Zone. When the Zone is being armed or disarmed, a user-definable time shall be set for exit or disarm operations. Specific readers/doors shall have the ability to be defined as arm/disarming stations.
6. The Intrusion Zone shall be configured such that when an input configured in a Zone is active, the Zone cannot be armed without executing a force arm. When a Zone is force armed, the input(s) that were in an active state shall not function as part of the Zone until they are placed back in a normal state and the Zone is disarmed and rearmed.
7. Inputs configured in a Zone shall have the ability to be configured as Controlled Inputs or Monitored Inputs. A Controlled Input shall follow the state of the Zone. If the Zone is disarmed, the Controlled Input shall be disarmed as well. A Monitored Input shall have the ability to cause a Zone violation even if the Zone is in a disarmed state.

W. Schedules

1. The ACS shall support unlimited operator configurable schedules. Each schedule shall allow unlimited individual time intervals.

2. Each system controller shall support a minimum of 128 schedules and a minimum of 18 time intervals per schedule.
3. Each schedule shall consist of operator-defined time segments. Each time segment shall be day(s) of the week and include holidays and starting and ending times. The system shall provide grouping of days.
4. Recurring schedules shall be supported and provide hourly, daily, weekly, bi-weekly, monthly, quarterly, annual and semi-annual intervals. Recurring schedules shall support a start date and shall be configurable to end by a certain date or after a pre-defined number of occurrences.
5. Recurrence patterns shall be supported to allow:
   a. Schedule recurs every X year(s)
   b. Schedule activates on the last day of each month
   c. Schedule activates on the specified day of each month
   d. Schedule activates on the first, second, third etc. weekday of each month

X. Holidays
1. The ACS shall support unlimited holidays.
2. The ACS shall support holiday type designations as Recurring Day of Month, Recurring Relative Monthly, Non-Recurring or Day of Week. The ACS shall allow assignment of duration to each holiday.
3. Holiday groups can be assigned to a Schedule.

Y. Time Zones
1. The ACS shall maintain time zones to be used when configuring certain system objects. A time zone shall adhere to standard international Time Zone behavior, and the system shall support all time zones supported by the Windows OS.
2. The ACS shall allow time zones to be assigned to IP devices, controllers, VMS, NVRs, and scheduled Manual Actions.

Z. Clearances
1. The ACS shall support configuration of unlimited Clearances.
2. The iSTAR controllers shall support up to 150 clearances per person.
3. The ACS shall support clearance activation and expiration date and time.
4. The ACS shall support the ability to select multiple personnel from a Dynamic View and assign clearance(s) to the selected personnel.
5. The ACS shall support the ability to select multiple personnel from a Dynamic View and remove clearance(s) from the selected personnel.

AA. Custom Clearances
1. The ACS shall support the configuration of up to 20 Custom Clearances per Personnel record and up to 100,000 system-wide. Custom clearance shall give unique individualized access to Doors/Door Groups and Elevators/Elevator Groups during an assigned schedule. The ACS Custom Clearances shall also support the assignment of activation and expiration dates.
2. The ACS shall support a process to remove expired custom clearances from personnel records. The process shall be configured as a system-wide event action with the option to activate by schedule.
3. The ACS shall support Clearance Filters. Clearance Filters shall provide the ability to dynamically change the access rights of personnel (cardholders) or groups of personnel. Personnel with a lower Clearance Filter level than that assigned to a card reader shall be denied access to that card reader (door). Clearance Filter levels shall be assignable to card readers either manually or automatically via event logic or a time schedule.

BB. Events

1. The ACS shall support unlimited operator configurable events, including the scheduling of events, and action-based trigger of events.
2. The system shall provide 8 configurable event priority levels with a total of 200 numbered event priorities. The system shall allow the operator to define custom colors and labels per individual priority level.
3. The system shall allow an event to be configured to:
   a. Be sortable by event name, date/time, priority, state, and any other displayable information.
   b. Be routed to operators by operator privileges, including support for the routing by time of day feature.
   c. Require or not require operator acknowledgment.
   d. Require or not require operator clearing.
   e. Require or not require a log message to be entered by the system operator acknowledging the event.
   f. Require or not require a log message to be entered by the system operator clearing the event.
   g. Display or not display the event activation.
   h. Require the object(s) causing the event activation to reset before the operator may acknowledge the event.
   i. Display an operator-defined text message upon event activation.
   j. Display an operator-defined text message when the event is deactivated.
   k. Be associated with a map so the map opens automatically on the monitoring station when the event activates.
   l. Activate a second event when the first event activates and is unacknowledged for a specified period of time.
   m. Activate a second event when the first event activates, is acknowledged and is not cleared for a specified period of time.
   n. Allow the operator to associate an audio wave file with the event.
   o. Allow for minimum activation time and delayed activation time for events.
   p. Download events to the iSTAR controllers.
   q. Run imports and exports.
   r. Run reports and remove report results.
4. Event Instructions
   a. Each event shall support event instructions to be displayed in the Event Details Screen. Event instructions shall support a maximum of five hundred characters and shall support website addresses, UNC addresses and local file paths.
5. Latch, Unlatch, Toggle, and Pulse for Event
   a. The ACS shall support Event Actions and Manual Action buttons that can be used to Latch, Unlatch, Toggle, and Pulse other Events.
   b. The ACS shall support a “Latch” Event Action which shall cause it to activate and remain activated.
   c. The ACS shall support an “Unlatch” Event Action which shall cause it to deactivate and remain inactive.
   d. The ACS shall support a “Toggle” Event Action which shall reverse an Event’s Latch-Unlatch state: switching a Latched Event to an Unlatched Event and vice versa.
   e. The ACS shall support a “Pulse” Event Action which shall cause an event to activate momentarily.
6. The ACS shall allow an operator to create a copy of an existing event from within the event editor.
7. Event Assessment:

a. The ACS shall provide an Event Assessment Feature which allows an operator to quickly view all objects associated with an event in a user defined Event Assess Application Layout.
b. The ACS shall not require the operator to navigate away from the event assessment window to review objects associated with the event.
c. The ACS shall provide an Event Editor "Assess Configuration" to allow an operator to configure the objects available during the assessment of an event in the Monitoring Station.
d. The Assess Event Application Layout shall have the following capabilities:
    1) View any documents associated with the Event.
    2) View Event details.
    3) View a Map associated with the Event.
    4) View a Journal Replay of the event, based on a query associated with the Event.
    5) Use an Event Details Viewer with additional quick action buttons to process the Event.
e. Each event shall provide the ability to show the entire Event Assessment with a single mouse click via an icon.
f. The event assessment layout shall only be available for viewing by operators with appropriate privilege.

CC. Dual Phase Event Acknowledgement

1. The ACS shall have the capability of configuring user defined events (alarms) to require Dual Phase Acknowledgement. Dual Phase Acknowledgement shall provide a Pending Acknowledgment window and a Pending Clear event monitoring window in addition to the System Activity window. Each event in the ACS shall be configurable individually to use Dual Phase Acknowledgement. Once the event is acknowledged, it shall be removed from the Pending Acknowledgment window and shall appear in the Pending Clear event monitoring window. A monitoring station operator with the appropriate privilege to clear events can select the event from the pending clear event monitor window and click the clear event button to clear the event. Events that require clearing and are waiting to be cleared shall be configurable to require acknowledgement upon re-activation of the event.
2. Events configured for Dual Phase Acknowledgement shall have the following features:
    a. The event shall be configurable to require a log message for alarm acknowledgement and or alarm clearing.
    b. Predefined log messages shall be assignable to alarm acknowledgement and or alarm clearing.
    c. The ACS shall support the configuration of an Operator's monitoring station permissions to determine if the operator can only acknowledge events, only clear events, or can acknowledge and clear events.
    d. Operators with acknowledge and clear privileges shall be able to acknowledge and clear events in a single action.
    e. A Dual Phase Acknowledgement event shall be configurable so the acknowledging operator can't clear the event. (In this configuration, clearing the event shall be required by a different operator.)
    f. Events that are acknowledged or silenced shall be configurable to remain silent until cleared.
    g. A user-defined timer can be configured to activate a second event if acknowledgement of an event, or clearing of an event, does not take place within the specified time frame. The timer shall start when the event is activated.

DD. Sounds

1. The ACS shall include a Sound editor that allows an operator to create Sound objects to associate with 'Play Sound' Actions for Events. A single Sound object may be associated with multiple Events, rather than having to save an individual sound file multiple times—each associated with a single Event.
2. Sounds shall be saved in a Sound table in the ACS database.
3. Sounds shall replicate, on an enterprise system, but they will be Local Only.
4. The ACS shall support the ability to import and export Sounds in .WAV file format. The size of the .WAV files that are imported shall be enforced to be less than 1460000 bytes (1.39 MB).
5. Sounds shall be Privilege based.

EE. Journal Triggers
1. The ACS shall support a Journal Triggers editor that allows an operator to define Triggers to activate an Event when a specified Journal Message occurs. The Journal Trigger shall be a Query-like object that evaluates Journal Messages and pulses an Event when the criteria specified in the configured trigger is logged in the Journal. The ACS shall support up to a maximum of 500 Journal Triggers.

FF. Manual Action Challenge
1. The ACS shall support Manual Action Challenges. The Manual Action Challenge shall require a ACS operator to enter their login credentials (User name and password) when executing a manual action from within the ACS.
2. The Manual Action Challenge shall be available from both the Administration and Monitoring Applications.
3. The Manual Action Challenge shall be assigned to a Privilege and the Privilege shall be assigned to the ACS operator.

GG. Document Editor
1. The ACS shall support the ability to import multiple types of document objects to include:
   a. PDF, TXT, XML, DOC, XLS, JPG, GIF, PNG, TIF
2. The ACS shall have the ability to attach these object types to the following areas:
   a. Personnel records to provide additional information.
   b. Events as part of the Events Assessment Feature.
   c. A Guard Tour

HH. Integrated Email
1. The email system shall have the ability to interface directly to an SMTP-compliant email system supplied and configured by the user.
2. The email configuration shall support user authentication via a password and SSL encrypted communication to the email server.
3. The email system shall support the ability to send emails to Personnel Groups.

II. Import / Export
1. The ACS shall provide a means for manually importing and exporting selected data in XML format. This mechanism shall support the import and export of any and all classes or types of data in the system. Specific data validation and logging requirements shall be met.
2. The system shall also support importing from CSV files.
3. The ACS shall provide an automated import mechanism (preferably XML-based). This mechanism shall support the import of most classes or types of data into the system. Specific data validation and logging requirements shall be met.

4. The ACS shall have the capability to perform automated imports from an Open Database Connectivity (ODBC) data source allowing the import of personnel data directly into the system database.
5. The system shall have the ability to connect to a directory service source via the Lightweight Directory Application Protocol (LDAP). The connection to the LDAP source shall be user-configurable directly from the ACS and shall not require custom code. The LDAP interface shall also support the automatic assignment of ACS clearances based on data contained in the LDAP record. The LDAP feature shall support the following features:

    a. LDAP server name and user-defined port number.
    b. A base distinguished name for the root of searches.
    c. A user-definable LDAP search filter to refine object search.
    d. User-defined mapping of attributes to ACS personnel fields.
    e. The use of a Distinguished Name (DN) entry for the ACS to authenticate to LDAP.
    f. Option to search all sub-levels of the directory from the base DN.
    g. Preview sample-data based on ACS LDAP import settings.
    h. Automatic roles-based ACS clearance(s) based on two fields of source data.
    i. Automatic import of directory entries from the LDAP source.
    j. Authentication via a user-definable LDAP user account and SSL.
    k. Automatic ACS clearance assignment.
6. The ACS shall provide a Data Mapping feature that provides field mapping information using the XSLT file based on the input data or an external XSLT file.

JJ. Objects
1. Each object within the ACS shall be addressed by a unique operator-defined name. Object names shall be unique within object types.
2. The ACS shall provide the ability to add description text to each object definition.

KK. Reports
1. The ACS shall support a Report Service that runs as a Windows Service. The Report Service shall operate in either 64 or 32 bit mode. The Report Service shall execute Reports that are either run on the Server by an Operator or configured to run automatically as an Event Action.
2. The ACS shall provide configurable data reports for database configuration, historical activity (Journal) and audit tracking. Pre-defined reports shall be available for download and import into the system.
3. The ACS report function shall perform the following:
    a. Create reports about any object.
    b. Create report templates to simplify report design.
    c. Run reports on demand.
    d. Save report results for sharing between different users of the application.
    e. Export reports into formats such as PDF, RTF, TXT, TIFF, Excel (XLS), and MHTML.
    f. Specify a query to select and filter the records on which to report.
    g. Specify the data fields to be included in a report.
    h. Specify a design for the report layout.
    i. Design a report form to be used as a layout for headers / footers for multiple reports.
    j. Access and use system pre-defined report forms.
    k. Select tabular, multi-line, or free form report layouts.
    l. Report on objects linked together with parent / child relations.
    m. Schedule reports to run automatically on a customized schedule.
    n. Send exported report files to the printer or to external recipients via e-mail.

4. The ACS shall support integration to The Business Intelligence Reporting Suite (BIRS). The suite shall offer web-based reporting as well as data warehousing of ACS historical and system data. The suite shall include multiple pre-written reports such as 24 Hour Journal Messages, 24 Hour Trouble Messages, Graphical Usage and Count of Door Group. The open system procedures shall allow the reports to be written and saved for repeat use.
5. The reporting suite shall provide an interactive user experience via any standard web browser, allowing the user to scrutinize the information without needing to print or review hard copies.
6. The reporting suite shall support connecting to one or more ACS systems. This shall provide data and reports across an enterprise solution to allow segregated reports that reflect both satellite application server data as well as master application server data.
7. The reporting suite shall allow an enterprise to share and blend data from other sources such as ERP and Time and Attendance systems to yield critical business information and reporting.
8. The reporting suite shall provide information delivery options such as email, CSV export, PDF export, XML data transfer, or database pool offerings. The suite shall also be a critical resource in system review and audit procedures such as system maintenance and performance.
9. The Reporting Suite shall:
    a. Provide Intuitive user interface and web-based reporting for ACS customers
    b. Share and blend data from other sources to yield critical business information
    c. Leverage Microsoft® Business Intelligence (BI) tools
    d. Include Reporting Service for report delivery and presentation
    e. Perform Reporting and processing from the ACS host
    f. Include Subscription options for automated delivery of reports
    g. Include Dashboard, graphical, and statistical reports, and reports customized by user
    h. Generate Reports on any PC with compatible Web browser without ACS Client software
    i. Offer and secure Data via Active Directory and SQL permissions
    j. Include Optional front end or other application integration including SharePoint

LL. Dynamic Views

1. The system shall support a grid format displayable report that will be usable to display homogeneous lists of objects within the system. This display shall be configurable both at configuration time and also at run time.
2. The Dynamic views shall have the following features:

    a. Real-time updating and display of property values.
    b. The display shall be sortable.
    c. Groupable by any number of columns.
    d. Filterable based on user selectable criteria.
    e. Printable.
    f. Can be saved as a MS Excel file from the current view.
    g. Exportable in either XML or CSV file formats.
    h. The export file shall be viewable in Excel (Excel must be installed separately).
    i. The export file shall be able to be emailed.
    j. The user shall be able to add and remove columns from the grid at runtime to enhance the user experience even if displaying a preconfigured view.
    k. The view shall be capable of pre-configuration so that repeatable displays of objects are possible.
    l. The view shall support in-place editing of properties of the object.

m. Bulk operations shall be performed via multi-selection. The operations shall consist of (but are not limited to) setting a property to a value and deletion.

MM. Query

1. The ACS shall provide a Query engine to be useful for users without any knowledge of SQL or any other specific query language. It shall allow users to make requests against data sets with preconfigured relations between tables. The relations shall reflect the actual relations between database objects and the user shall be able to put conditions on any available field in the selected object type and its subordinate objects.
2. The users shall be able to construct a proper query expression selecting all available operations, column names, and table names from prompted lists. It shall eliminate the necessity to memorize any particular expression syntax. References to existing configuration objects shall also be prompted through a list of existing objects where applicable, eliminating the necessity of memorizing names. The Query feature also shall support complex logic, such as AND/OR.
3. Negative logic Queries using the new NOT IN operators
4. The ACS shall support Query filters that perform AND/OR operations to narrow Query results. The ACS shall also support building complex query operations by use of block filters that perform AND/OR/AND NOT IN/OR NOT IN operations to further narrow Query results.
5. The ACS shall provide a Journal Query Assistant as a special method of the Query engine to query on XML fields within Journal Messages. This method shall allow the user to build queries on Journal messages. The Journal Query Assistant shall support Card Admitted, Card Rejected, Operator Login and Operator Activity message types, Area Activity, Object Changed State and Manual Action message types.

NN. Guard Tour

1. The ACS shall support Guard Tours.
2. A Guard Tour shall consist of a series of predetermined Stops requiring a Guard to check-in at each Stop to complete the Tour within the specified time. The Guard Tour shall consist of any combination of Doors, Elevators, and Inputs.
3. The ACS shall support a maximum of two hundred Guard Tours.
4. The maximum number of Stops per Guard Tour shall be one hundred.
5. The ACS shall support up to a maximum of fifty simultaneous running Guard Tours.
6. The ACS shall support two types of Guard Tours: Sequential and Random requiring the Guard to check all Stops in sequence or in a random order.
7. A sequential tour shall be configured with a minimum and maximum time that a guard shall have between stops.
8. Each Tour shall be configured with a specific group of guards that shall be allowed to execute the Tour.
9. The following Tour states shall be available to activate preconfigured events in the ACS:
   a. Activated
   b. Started On Time
   c. Started Early
   d. Started Late
   e. Suspended
   f. Suspended too Long
   g. Resumed
   h. Cancelled
   i. Completed
   j. Completed Early
   k. Completed Late

l. Inactive
m. Not completed On Time
n. Failed To Start
o. Error Occurred

10. A guard Tour shall have the ability to be initiated from:
    a. The reader configured as the first Stop of the Tour
    b. An Event (Manually activated or on a Schedule)
    c. A manual Action from an Operator at the ACS Monitoring Workstation
11. The ACS shall support sending an email notification to a Guard of the impending start of the scheduled Tour.
12. A Guard shall be required to complete check-ins at all Guard Tour Stops before the maximum completion time expires and shall be required to spend at least the minimum amount of time on the Tour.
13. A Tour shall be canceled by either an error, event action or a manual action from an Operator at the ACS Monitoring Application.
14. Each Tour shall be able to be configured with a minimum and maximum time of completion.
15. The system shall indicate that a Tour Stop was reached early and started early if a guard checks in at the first stop before the minimum stop time expires.
16. The system shall indicate that a Tour Stop was reached late when a guard checks in at the first Stop after the maximum time expires.
17. The System shall indicate that a Tour Stop was not reached on time when a guard has not checked in after the maximum Stop time expires.
18. In the ACS Monitoring Station Application, it shall be possible to display the details of all the Guard Tour Stops and the current status of the Tour.
19. Each Guard Tour shall have the ability to attach up to a maximum of ten documents explaining the details of the configured Guard Tour.
20. Each Guard Tour shall support Predefined Log Messages or Message Groups.
21. Tour status shall be available from the ACS Monitoring Station Application and shall provide the following information:
    a. Tour Type
    b. Last Tour Status
    c. Current Tour Status (Running/Not Running)
    d. Guard Name (if active)
    e. Last Completed Stop
    f. Percentage Completed.
22. The ACS shall provide the ability to configure an icon on an ACS MAP representing a Guard Tour. An Operator shall have the ability to start the Tour and manually assign a specific Guard responsible for completing the Tour from the MAP.
23. The icon representing the Tour shall change appearance based upon the current state of the tour.
24. The ACS shall provide the ability to run a Journal Report providing the details of any completed or active Tour including;
    a. Time scheduled
    b. Guard assigned
    c. Activation time
    d. Stop status
    e. State complete

OO. General Purpose Interface
1. The ACS shall support a licensable General Purpose Bi-directional Serial Interface.

2. The General Purpose Interface shall be a programmable bi-directional communication protocol that shall provide a general mode of communication between the ACS General Purpose Interface driver and a third-party device.
3. The third-party device shall send pure ASCII messages via a serial port (RS-232) or remotely via a TCP/IP port (via a Terminal Server) into the General Purpose Interface driver.
4. The ACS shall interpret messages in two ways:
5. As journal messages recorded into the ACS historical journal.
6. As any of five Monitoring Point status changes configured to trigger an ACS event.
7. The General Purpose Interface supports the following functionality:
    a. Input: where the input strings are sent from the device through the Serial/Network port to the ACS Server. The General Purpose Message Protocol object is used to define and parse the information.
    b. Output: where the output is an Action and requests a response from the device.
    c. Poll: where the poll is an action that requires a response from the device.

PP. ID Badging Subsystem

1. The ACS shall include an embedded ID Badging Subsystem. The ID Badging subsystem shall utilize a common database with and be an integral part of the ACS. The ID Badging Subsystem shall provide the ability to capture cardholder images and design and print user-defined badge layouts. The Badging Subsystem shall support the following capabilities:
    a. Unlimited number of badge design layouts.
    b. WYSIWYG badge designer.
    c. Background color detection in the portrait image.
    d. Threshold level selection to apply to background detection.
    e. User-defined selection of background color.
    f. User-defined selection of replacement color or transparency setting.
    g. Edge-detection setting, to aid in replacing only the selected background and not any matching color within the portrait image.
    h. Capture, import, and display portraits.
    i. Capture, import, and display signatures.
    j. Capture and display fingerprints.
    k. Insert, import, and display foreground and background images.
    l. Print two-sided badges.
    m. Encode magnetic data onto personnel badges.
    n. Insert 1D or 2D bar codes.
    o. Insert or replace color and transparent effects for image and background display.
    p. Support a variety of image formats including .bmp, .jpg, .tif, and .wmf.
    q. Custom functions using the Expression builder.
    r. Multiple images per cardholder.
    s. Diagonal and Square borders. Each type of border shall support a user-defined width and height setting, and individual color settings for each border side.
    t. Proper Case (first letter in string is set to uppercase, all other characters set to lowercase).
    u. Year display (four- or two-digit).
    v. Month display (full or abbreviated name, or numeric).
    w. Day display (full or abbreviated name, or week/month numeric).
    x. Hour display (12 or 24 hour format).
    y. Minute display.
    z. Second display.

QQ. Smart Card / Proximity Card Enrollment

1. The ACS shall provide a smart card enrollment feature as part of the ID Badging Subsystem. The smart card enrollment feature shall allow a user to enroll MIFARE, iCLASS or DESFire cards utilizing a USB wedge reader or a Manufacturer-approved badge printer.
2. The ACS shall provide a proximity card enrollment feature as part of the ID Badging Subsystem. The proximity enrollment feature shall allow a user to enroll the card number of proximity cards on a Fargo HDP 5000 printer that is equipped with an OMINKEY CardMan 5x25 encoder.
3. The ID Badging Subsystem shall support the creation of Smart Card Templates to define the smart card configuration. Templates shall be used to define the data transfer between the physical card and the Personnel Record. Templates shall define the card type as MIFARE, iCLASS or DESFire. When programming a card, the system shall be able to read and write to all relevant data such as personnel fields, card fields or card formats. The Badging Subsystem shall provide the ability to Enroll MIFARE, iCLASS or DESFire. The Badging Subsystem shall provide the ability to Program and Enroll MIFARE.
4. Templates shall also be utilized to define the Security Keys needed to access the data on the smart card. Templates shall be assignable to the enrollment device (wedge reader or printer).
5. The ID Badging Subsystem shall support both the enrollment (reading of data from the card) and programming (writing of data to the card) for MIFARE cards. The ID Badging Subsystem shall support the enrollment of DESFire cards and shall support Card Serial Number data only. The ID Badging Subsystem shall support the enrollment of iCLASS cards and shall support Card Serial Number data only.
6. The ID Badging Subsystem shall support the creation of Custom read/write Keys. Custom Keys are private keys supplied by a third party. Custom Keys shall be assigned to Software House Readers via Program Cards supplied by the Manufacturer.

2.4 OPERATION

A. The ACS shall provide the following operational functionality:

1. The system shall control access to a designated area.
2. The system shall validate cardholder credentials by use of downloaded personnel records, card formats, PINs, biometric enrollment and multiple active cards. The system shall compare the time, location, and unique credential number of an attempted entry with information stored in memory.
3. Access to a designated area will be validated only when a user's credential has a valid number for its facility and the number is valid for the current time and for the reader where it is used.
4. The system shall access the hardware that validates the person and monitor the security of a building by use of controllers, doors, readers, elevators, inputs and outputs. When access has been validated, a signal to the door locking device shall be activated to enable alarm-free access at that location.
5. The system shall configure itself as required by use of an Administrative application, and shall provide Configuration templates.
6. The system shall monitor access control activities by use of Monitor Station, Alarm configuration, NetVue, VMS, and dynamic Graphical Maps display of alarm, door, and event activity (Maps based on CAD data).
7. The system shall restrict administrative and Monitoring Station activity by use of Privileges and Authentication (User Password) using Microsoft Windows OS Password Function.

8. The system shall report on various aspects of the system by use of Reports (canned and configurable). Reports shall be able to export to a printer.
9. The system shall have the capability to report off-normal security device conditions both audibly and visually.
10. The system shall control hardware from the monitoring station by use of Manual actions, Events, and cause lists.
11. The system shall provide Record and Data Management by use of Historical Journal (archive and replay), Full Audit Trail and automated and manual import and export (data and images).
12. The system shall allow for data to be imported from other products by use of database Migration tools.

2.5 EQUIPMENT-ACS HARDWARE AND SOFTWARE REQUIREMENTS

A. The ACS Server shall meet the following recommended requirements:
   1. The server Processor shall be:
      a. Intel Xeon Quad-Core E3-1240 (3.3 GHz or greater)
   2. The server shall have Dual Hard Disk Drives:
      a. Primary drive: 300 GB - 9000 Runtime
      b. Secondary drive: 300 GB – Data Backups
   3. Drive Speed: 15,000 RPM or greater.
   4. The server shall have the following Memory:
      a. 16 GB dedicated to the ACS
   5. The server shall have the following Network Adapter Card:
      a. Intel Gigabit ET Quad Port Adapter, Gigabit Ethernet NIC, PCIe x4
   6. The server shall have a DVD Drive
   7. The server shall have a 24” or larger SVGA (1024 x 768) monitor with true color support.
   8. The server shall have a PS/2 or USB style mouse.
   9. The server shall have an appropriate backup device
   10. The server shall support the following Operating Systems:
      a. Windows Server 2012 Standard and Windows Server 2012 R2 Standard (64-bit)
      b. Windows Server 2008 R2 Standard and Enterprise (64-bit)
      c. Windows 7 Professional and Enterprise (32- and 64-bit) (L-N SAS only)
      d. The server shall support the following Database:
      e. SQL Server 2012 Standard and Enterprise (32- and 64-bit)
      f. SQL Server 2008 R2 Standard and Enterprise (32- and 64-bit)
      g. The server shall have Web Server IIS v6.0 or higher

B. Client Workstation Requirements
   1. The ACS client workstations shall meet the following recommended requirements:
   2. The client workstation Processor shall be:
      a. Intel Core i5-3470 (6 MB, 3.2 GHz or greater)64 bit Processor .
   3. The client workstation shall have a Hard Disk Drive of 500 GB, Drive Speed:
      a. 7200 RPM or greater.
   4. The client workstation shall have the following Memory:
      a. 4 GB on 32-bit OS; 8 GB on 64-bit OS
   5. The client workstation shall have the following Network Adapter Card:
      a. 1 GB NIC or greater network card, rated at 100/1000 MB/sec
   6. The client workstation shall have a DVD Drive.
   7. The client workstation shall have a 23” or larger SVGA (1024 x 768) monitor with true color support.

8. The client workstation shall have the following video card:
   a. 1 GB NVIDIA Quadro 600
9. The client workstation shall have a keyboard and a PS/2 or USB style mouse.
10. The client workstation shall support the following Operating Systems:
    a. Windows Server 2012 Standard and Windows Server 2012 R2 Standard (64-bit)
    b. Windows 7 Professional or Enterprise (32 and 64 bit)
    c. Windows 8.1 Professional and Enterprise (32- and 64-bit)
    d. Windows Server 2008 R2 Standard and Enterprise (64-bit)

C. Badging Station Requirements
1. The ACS badging workstation shall meet the following minimum requirements:
2. The badging workstation Processor shall be:
   a. Intel Core i5-3470 (6 MB, 3.2 GHz or greater)64 bit Processor .
3. The badging workstation shall have a Hard Disk Drive of 500 GB, Drive Speed: 7200 RPM or greater.
4. The badging workstation shall have the following Memory:
   a. 4 GB on 32-bit OS; 8 GB on 64-bit OS
5. The badging workstation shall have the following Network Adapter Card:
   a. 1 GB NIC or greater network card, rated at 100/1000 MB/sec
6. The badging workstation shall have a DVD Drive
7. The badging workstation shall have Operating System
   a. Windows 7 Professional or Enterprise (32 and 64bit)
   b. Windows Server 2008 R2 Standard and Enterprise (64-bit)
   c. Windows 8.1 Professional and Enterprise (32- and 64-bit)
8. The badging workstation shall have a 24” or larger SVGA (1024 x 768) monitor with true color support.
9. The badging workstation shall have the following video card:
   a. 1 GB NVIDIA Quadro 600
10. The badging workstation shall have a keyboard and a PS/2 or USB style mouse.
11. The badging station shall have a USB camera that supports TWAIN protocol for photos.
12. The badging station shall have a PVC printer.

D. Intelligent Network Controllers
1. The Intelligent Network Controller (INC) shall be an independent, modular controller designed to integrate various event management applications on one controller, providing ease of installation and interoperability among vital applications. The INC shall be an independent and totally self-contained, microprocessor controlled Network Controller used to enhance or control a variety of existing and new systems. The INC shall serve as the data collection and communications interface between the System Server and the various field devices such as card readers, alarm inputs and control outputs.
2. Each Intelligent Network Controller shall accept a regulated input voltage of 11.5VDC to 13.8VDC and generate appropriate voltage levels for on-board use as required. The maximum power required shall be calculated based on the number of readers and other auxiliary devices connected to the INC not to exceed 5A at 12VDC. All power outputs to external devices shall be current limited by the INC.
3. The INC shall be housed in a locking 16 gauge steel enclosure, suitable for wall mounting in accordance with UL 294. All cabinet locks shall be keyed alike. The cabinet shall be suitably sized to allow installation of the INC and associated field wiring. A single, Normally Closed (NC) tamper switch shall be incorporated into the door. There shall be 12 knockouts on the enclosure of various sizes to facilitate conduit and wire routing.

4. The Intelligent Network Controller shall meet the following regulatory requirements: FCC Part 15, CE, UL 294, and UL 1076. UL 1076 shall be applied only to the overall system as required.
5. The General Controller Module (GCM)
6. The General Controller Module (GCM) is the core of the Intelligent Network Controller. The GCM consists of three major subsystems, Software services, GCM Hardware and the Access Control Module (ACM).
7. Software services
    a. A set of Communications Services shall be provided to facilitate communication between the System Server and GCM, as well as between controllers. The service shall also allow configuration of communication ports and shall handle all data encryption and communication protocol specifics.
    b. The network system shall be designed to support advanced distributed network architectures, whereas INCs do not need to be home-run wired back to the System database server. INCs shall be wired at any point on the Local Area Network (LAN)/Wide Area Network (WAN) via industry standard Ethernet utilizing the TCP/IP protocol. INC shall be able to communicate back to the System database server through industry standard network switches and routers and shall not be required to reside on the same subnet as the System Server. Any activity or event within the INC network shall be routed to any client workstation(s) on the network, regardless of the INC that handles the activity. The System Server shall manage any message routing issues, thus isolating the subsystem applications from network-specific communication details.
    c. The INC to System Server communication shall include authentication and a minimum of 128 bit encryption that conform to industry-accepted standards.
    d. Upon losing and then restoring communications between the INC and the System Server, database synchronization between the System Server database and the local database in each Controller shall be fast and efficient. When communications are restored, database synchronization shall occur immediately and without System Operator intervention. Any changes made to the System Server database while the INC was off-line shall also be simultaneously downloaded to all required INC databases.
    e. Multiple communication techniques may be utilized between the System Server and controller. Communication from controller to controller is via TCP/IP only. The GCM shall support DHCP. Each GCM may be configured to accept IP address and device names from local DHCP (Dynamic Host Configuration Protocol), WINS (Windows Internet Naming Service) or DNS (Domain Name System) servers. The GCM shall have RS232, and Ethernet (RJ-45) ports on-board and shall not require external devices to connect to the network. An external modem may be connected to the serial RS232 port for dialup communication. The GCM shall also contain two Type II PC Card slots for additional types of communication including modem, Ethernet, FDDI, wireless, etc. Serial communication to an INC shall always be point-to-point. Daisy chain or multi-drop serial communication shall not be supported. However, a single connection (of any type) from the host can support multiple Intelligent Network Controllers via Clustering.
    f. Every INC shall be part of a “cluster”, even if it is only a cluster of one. A cluster is a user-defined grouping of Intelligent Network Controllers. Each cluster has a master INC. The master is the primary connection between the cluster and the System Server. Communication from the System Server to the master shall be any of the previously mentioned methods. The other cluster INCs are referred to as members. Member INCs do not communicate directly to the System Server or to each other;

rather their communication path to the System Server and to each other shall be through the master. Communication within a cluster is always through a TCP/IP supported physical medium. Each master INC shall support an alternate communications path to the System Server. In the event of a primary communications path failure, the master INC shall immediately attempt to utilize the secondary or alternate communications path. The alternate path can be any medium including dialup modem or secondary/backup Ethernet network. Each cluster shall support an alternate master. The alternate master is an optionally designated member INC that manages communication to the System Server in the case of a master INC failure. Messages from member controllers shall be routed through the alternate master until communication with the master controller can be reestablished.

g. Communication between the System Server and the INC shall be asynchronous. The Intelligent Network Controller shall not require any poll messages between the System Server and the INC. Messages shall only be transmitted when required and messages can be initiated by any INC or by the System Server. The INC shall transmit a network heartbeat to the System Server to satisfy UL requirements.

8. Common System Services
   a. Common System services shall include a system watchdog, event handling services, time management services, software update services, database backup services and diagnostic services.
   b. The System Watchdog shall constantly monitor all internal processes and if it detects a problem, it shall reboot the controller. A hardware watchdog shall also run and reboot the controller if the system software fails to strobe it.
   c. The system shall provide the ability to update the INC firmware stored in FLASH remotely from the host or from the diagnostic service. If the update image becomes corrupted, the controller can fall back to an original boot image. The boot image shall restart the INC and inform the host to re-send the update image. This feature allows the controller firmware to be easily upgraded to add new features.
   d. Database backup: In the event of an unexpected power-loss, the INC shall automatically save the system and application databases for up to 48 hours.
9. Event Handling Services
   a. The GCM system firmware shall provide a service that will serve as a clearinghouse for all activities generated on an Intelligent Network Controller. The System Server shall download a list of action definitions and a list of events to each INC. The system software shall provide an interface for reporting activities or events in real time as they occur.
   b. Event Linking shall tie an activity on one controller to the triggering of an action on the same or different controller. The Server Controller shall support three types of event linking:
      1) Local Event Linking: When the source device and the target device are linked through an activity on the same INC, local event linking shall occur.
      2) Cluster Event Linking: When the source device and the target device being linked are on different controllers in the same cluster, cluster event linking shall occur. The transmission of the action request from one controller to another shall occur (routed through the master controller) with no System Server intervention.
      3) Global Event Linking: When the source device and the target device being linked are on different clusters, global event linking shall occur. This cross-cluster linking will require that the action request be routed through the System Server. The event link definitions shall be created on the System Server and shall be downloaded to the appropriate INCs. The System Server shall also insure that the event link definitions are valid and that there are no recursive links.

c. Action Scheduling - The system software shall provide an action scheduling service that will execute actions on devices residing on the same or other controllers at a predefined time, frequency and time interval. The action definitions shall be the same System Server-defined actions utilized by event linking. The actions and the action schedule shall be defined by the System Server software and shall be downloaded to the appropriate controllers.
d. Offline / Online Reporting - The system shall provide a mechanism to report activities to the System Server for display, reporting and archiving. If a System Server is not currently connected to the cluster of controllers, the activity reports will be buffered until the System Server reconnects to the cluster. Should the user-configured, activity buffer limit be exceeded before the System Server reconnects, the first in first out rule shall apply.
e. Time Management Services - The system shall provide a service to manage user-defined time periods, called Time Specifications. These time specifications shall be defined on the System Server and downloaded to all controllers. The time management services shall also ensure that all controllers have a synchronized time clock.

10. Hardware
    a. The GCM hardware shall be comprised of several components. The current processor in the hardware design shall be the Motorola PowerPC 860. Each GCM contains one Ethernet port, three serial ports, two Type II PC Card slots, and an expansion connector, which can accept up to two Access Control Modules (ACM), and a LCD for diagnostics and program verification.
        1) Memory Configurations - The GCM board shall support 64MB of on-board memory for cardholder and event storage and be capable of expanding to 128MB via a field upgradeable DIMM. There shall be 16MB of on-board FLASH that shall be used for boot code and operating system code.
        2) PC Card Slots - The GCM shall support two Type II PC Card slots. This interface shall be fully compliant with the PCMCIA standard.
        3) Serial Ports - There shall be an RS-232 serial port that may be used for direct connection to the System Server or for dialup communication via an external modem.
        4) Ethernet Port - The GCM shall support 10BaseT Ethernet Communications. The interface to the Ethernet services shall be through a standard RJ-45 connector.
        5) Expansion Connector - The Expansion Connector shall be a 34-pin connector allowing connection of up to two Access Control Modules to the GCM. The second ACM shall connect to the first ACM via its expansion connector.
        6) Indicators/Switches - The GCM shall have several LED indicators that show system and communication status. The GCM shall provide three (3) banks of DIP switches to allow custom configuration of communication and software services.
        7) GCM LCD - The GCM shall support a LCD for status and field diagnostic messages. DIP switches shall be used to configure the GCM diagnostic modes.
        8) GCM Inputs - The GCM shall support dedicated Normally closed (NC) inputs to monitor cabinet tamper, power fail and low battery. The System Software Administrative Application shall support the configuration of all dedicated inputs connected to the GCM. The Monitoring Application Interface shall provide the status of the inputs and shall log changes in input status. Inputs shall be able to be taken offline for diagnostic purposes and each input shall support being linked directly to an output or to a system event. All input activations shall be

reported to the Monitoring Application and stored in the Historical Journal on the System Server.

9) Cabinet Tamper - Cabinet Tamper shall be normally closed and pre-wired to the enclosure door to report opening of the door as a tamper event.
10) Power fail and low battery - Power fail and low battery inputs shall be normally closed and wired from the apS battery backup power supply outputs to report main power fail and low battery conditions as required.

E. Access Control Module

1. All Access Control functionality shall be contained in the Access Control Module and its accessories. Access Control Modules shall be connected to the System Server through the GCM. Each INC shall support up to two (2) Access Control Modules and a maximum of sixteen (16) readers. The maximum number of supervised inputs per INC shall be one hundred and ninety two (192). The maximum number of relay outputs per INC shall be one hundred and seventy six (176).
2. Each ACM module provides sixteen (16) supervised inputs, eight (8) relay outputs and shall support a maximum of (8) readers, eight (8) I8 input modules and eight (8) R8 output modules. The Access Control Module shall support the option of direct or indirect Wiegand reader connections. Wiegand readers directly connected to the ACM may reside up to 500 ft. from the ACM with the proper 18 AWG wiring. Indirect Wiegand readers shall be connected via the RM series reader modules and may reside up to 4000 ft. from the ACM via a properly wired RS-485 bus. Each INC shall support up to eight (8) different card formats. Each card format shall support fifty (50) company and site codes. The card formats shall be assigned to any of the card readers.
3. Each Access Control Module shall accept a regulated input voltage of 11.5VDC to 13.8VDC and generate appropriate voltage levels for on-board use as required. The input supply voltage shall be bussed directly to the reader bus connectors to supply operating voltages for reader and input/output modules. The ACM shall provide a configuration jumper which shall allow either +12VDC or +5 VDC to be supplied the external read heads connected via the direct Wiegand ports. All Wiegand readers connected to the Wiegand ports shall have the same power requirements or an external power supply shall be required. All power outputs to external devices shall be power limited via PTCs.
4. There shall be eight (8) RS-485 ports provided, per ACM, for connecting external RM series reader modules and input\output modules. An end-of-line (EOL) termination resistor shall be provided for each port to satisfy RS-485 multi-drop requirements. The EOL termination for each RS-485 port may be individually disabled via an eight (8) position DIP switch to allow the ACM (INC) to reside in the middle of an RS-485 reader chain.
5. The ACM shall provide for direct connection of Wiegand read heads. The read heads connected to these ports shall conform to the industry standard Wiegand Output format and shall support multiple card technologies including magnetic stripe, Wiegand, proximity, barium ferrite, bar code and biometrics. Any unused direct Wiegand ports may be individually disabled via an eight (8) position DIP switch to allow faster polling for active readers. Any direct Wiegand reader port may be disabled and an RM series reader shall be connected in its place, through the reader bus, to extend the distance from the INC to the read head.
6. In addition to accepting card data from the read heads, the ACM shall control the LED's at the reader, supporting industry standard 2-wire or 1-wire control. The ACM shall also provide a signal line to control an external beeper at the reader with an active low going signal. The LED control shall support three LEDs - red, amber and green. The System Server shall support the configuration of these LEDs such that certain LEDs shall illuminate or not illuminate or pulse to indicate various System status conditions. These LEDs shall indicate the following status conditions as a default:

a. On-line Indication - Amber LED on steady
b. Off-line Indication - Red LED on steady
c. Card Accepted - Green LED pulses for door open time
d. Card/PIN - Amber LED pulses to enter PIN. Subsequent red/green LEDs mimic card input
e. Alarm Condition - All LEDs pulse in alternating pattern

7. The direct Wiegand reader ports shall support Wiegand readers with integrated Wiegand output keypads. The supported data format shall conform to industry standard 4 bit or 8 bit (4 bits plus 4 bits complimented) Wiegand keypad data. Three by four matrix keypads shall be supported through the use of an RM-4K or an RM-4E.

8. Sixteen (16) Class A Supervised inputs shall be provided on each ACM. All supervised inputs in the system shall require 1000 ohm (1K) EOL terminating resistor networks which may be configured to accept Normally Open (NO) or Normally Closed (NC) switches or contacts. Each EOL resistor network shall be configured such that 1K ohms is secure, 500 or 2000 ohms is an alarm condition, and an open or shorted input is a supervision alarm. Each ACM shall support eight (8) I8 Input boards, providing an additional sixty four (64) supervised inputs to each ACM. The System Software Administrative Application shall support the configuration of all Supervised inputs connected to the ACM. The Monitoring Application Interface shall provide the current status of the inputs and shall log changes in input status. Supervised inputs shall be able to be taken offline for diagnostic purposes and each input shall support being linked directly to an output or to a system event. All input activations shall be reported to the Monitoring Application and stored in the Historical Journal on the System Server.
9. Each ACM shall provide eight (8) form C, general-purpose, dry contact relay outputs, which are user configurable. These relay contacts shall be rated at 10A at a nominal voltage of 28VDC\24VAC. Each relay contact shall have two (2) metal oxide varistors (MOV's), rated at 56V, between the relay's common terminal and the normally open and normally closed contacts to prolong the contact life and protect the ACM from external devices being controlled by the relay. Each ACM shall support eight (8) R8 Output boards, providing an additional sixty four (64) outputs to each ACM. These relays shall be rated at 2A resistive and 1A inductive at 30VAC/DC. The System Software Administrative Application shall support the configuration of all outputs connected to the ACM. The Monitoring Application Interface shall provide the current status of each output and shall allow the manual activation of each output individually or in user-defined groups for diagnostic purposes. All output activations shall be reported to the Monitoring Application and stored in the Historical Journal on the System Server.

F. Reader Interface Module
1. A reader interface module shall be required for any card reader that is not connected to the direct Wiegand ports. This reader module shall be available as a separate module, or integrated into the design of an RM series reader. The reader module shall contain a rotary address switch allowing a unique address setting for each RM series reader module connected to the INC. The reader module shall accept either Wiegand or Clock/Data signals from read heads. A switch shall be available to set the read head signal format.
2. The reader module shall communicate with the INC utilizing two (2) wire RS485. The reader modules shall be connected to the INC in either a bus or star configuration, whichever is most appropriate for the installation. Reader modules shall not be installed in excess of four thousand (4000) feet from the INC. The four thousand (4000) foot distance limitation may be extended using manufacturer approved fiber optic cabling and transceivers.

3. The reader module shall operate on 11.5 to 13.8 VDC. Power for the reader module shall be supplied by the INC or local power supply. All data and power wiring shall be in accordance with manufacturer's specification.
4. The reader module shall include two (2) Class A alarm inputs and open collector logic for driving two (2) auxiliary relay/outputs. The reader module shall include a dedicated input for a tamper signal. The tamper switch shall be installed on those reader modules integrated into the RM series reader design. Physical access to the reader module shall not allow activation of the door locking mechanism.
5. The reader module shall contain an audible sounder. The sounder shall be able to be activated to provide feedback as keys are depressed on the reader keypad.
6. The INC shall poll each reader module. If after successive poll cycles, a reader module fails to respond to a poll, the INC shall report the Reader as Off-line to the System Server.
7. The RM series reader module shall support three (3) high intensity LEDs - red, amber and green. The System Server shall support the configuration of these LEDs such that certain LEDs shall illuminate or not illuminate or pulse to indicate various System status conditions. These LEDs shall indicate the following status conditions as a default:
   a. On-line Indication - Amber LED on steady
   b. Off-line Indication - Red LED on steady
   c. Card Accepted - Green LED pulses for door open time
   d. Card/PIN - Amber LED pulses to enter PIN. Subsequent red/green LEDs mimic card input
   e. Alarm Condition - All LEDs pulse in alternating pattern

G. The Diagnostic Web Server

1. The Diagnostic Web Server shall provide the user with real-time INC information that is sufficient to determine the operational state of the INC. Based on this information, a user should be able to determine the connection status, memory status, time and general condition of the INC. Predefined diagnostic tests may be executed and the results of these tests presented to the user. The Diagnostic Web Server shall present the following minimal information:
   a. INC Time/ Boot Time
   b. Total/Available Memory
   c. MAC and IP Address
   d. Connection Status
   e. Firmware and OS Versions
   f. Cluster Information

2. The Diagnostic Web Server shall support multiple simultaneous users and should have minimal impact on the normal operation of the INC. The Diagnostic Web Server shall utilize a standard security scheme that requires a user to log in using a password that shall be set via the System Server or the iSTAR Pro Configuration Utility (ICU).

H. Identification (ID) Cards

1. ID cards: Passive, proximity type (non battery operated) ID card , shall not deteriorate with age (minimum 5 year warranty). Cards shall be compatible with card sensor.
2. The ID card shall be capable of having a photo or image printed directly onto the surface of the card with a direct print printer, shall be offered with multicolor custom graphic, and shall have the option of slot punch on the short edge of the card for a vertical/portrait format.
3. The ID card shall be no larger than 3.375" x 2.125" with a maximum thickness of 0.035".
4. The ID card shall have up to 37 programmable bits of Wiegand formatted information for universal compatibility with all HID Weigand interface reader applications.

5. Provide each card supplied for this project encoded with a unique code not duplicated anywhere else. Cards shall be imprinted with a serial number, which shall not match or indicate in any manner the encoded cards number.
6. Tha ID card shall have an operating temperature of –50 to 160 degrees Fahrenheit and shall have an operating relative humidity of 5-95% noncondensing.
7. The read range of the ID card shall be extremely consistent, and not be affected by body shielding or variable environmental conditions.
8. Provide 500 cards for this project.
9. Models:
    a. HID

I. Card Readers - The multi-technology contactless smart card reader(s) shall be designed to securely read, interpret, and authenticate access control data from 13.56 MHz contactless smart card credentials and 125 kHz proximity cards.
    1. The multi-technology contactless smart card reader shall be optimally designed for use in access control applications by providing:
        a. Customized security protection through support of the device-independent Secure Identity Object™ (SIO) portable credential methodology to provide enhanced security and performance features.
        b. Unique read selection that enables reading of the Secure Identity Object™ (SIO), standard iCLASS, 125 kHz proximity, or two or all technologies at the same time.
        c. Participates in an advanced, bounded and trust-based security system utilizing the Trusted Identity PlatformTM (TIP) architecture.
        d. A migration platform to upgrade from the most popular 125 kHz proximity technologies to SIO on iCLASS SE by reading both 125 kHz proximity technology and 13.56 MHz contactless smart card technology.
        e. Guaranteed compatibility to read all HID data formats and ensuring card-to-reader interoperability in multi-location installations and multi-card and reader populations when used with Genuine HID products.
        f. Backwards compatibility with legacy 13.56 MHz contactless smart card and 125 kHz proximity access control formats (E.g. 26-bit, 32, 35-bit, 37-bit, 56-bit, and HID Corporate 1000 formats). Compatibility across the product line shall be assured without the need of special programming.
        g. Global, off-the-shelf availability.
    2. The multi-technology contactless smart card reader shall provide enhanced security technology and features.
        a. The multi-technology contactless smart card reader shall be Secure Identity Object™ (SIO) enabled. The multi-technology contactless smart card reader platform shall support the standards-based, device-independent Security Identity Object™ (SIO) portable credential methodology to ensure data authenticity and privacy. The SIO shall be able to reside on any number of identity devices, including iCLASS SE, MIFARE Classic SE, and MIFARE DESFire EV1 SE credentials
        b. The multi-technology contactless smart card reader shall be a certified end-point (TIP Node) within a Trusted Identity Platform™ (TIP) infrastructure. TIP shall provide a scalable, on-demand, secure identity delivery system that validates, registers and provides lifecycle management support for certified trusted end-point multi-technology contactless smart card readers.
        c. The multi-technology contactless smart card reader shall increase security by narrowing the possibility of unwanted configuration changes and denials of service. The multi-technology contactless smart card reader shall utilize TIP-enabled secure

configuration of multi-technology contactless smart card readers with counters and uniquely diversified configuration cards.

d. The multi-technology contactless smart card reader shall utilize Secure Element Technology™ to protect keys and cryptographic functions to the international standard Evaluation Assurance Level (EAL) 5+.
e. The multi-technology contactless smart card reader shall be configurable to utilize Velocity Checking to provide breach resistance against electronic attacks that invoke multiple improper authentication attempts.
f. The multi-technology contactless smart card reader shall be configurable to provide multiple hierarchical degrees of key compatibility for accessing the smart card access control data. Compatibility shall be provided for the following key structure options:
g. Compatibility with the standard SIO and iCLASS access control application data model to ensure convenient off the shelf compatibility with iCLASS SE and iCLASS credentials.
h. Compatibility with higher security SE Elite credential programmer that uniquely assigns a reader and credential keyset that provides site-specific security.

3. The multi-technology contactless smart card reader shall provide enhanced usability features.
   a. The multi-technology contactless smart card reader shall simplify troubleshooting through Anti-passback Notification that the card has already been processed and it must be removed from reader field temporarily prior to processing again.
   b. The multi-technology contactless smart card reader shall provide enhanced user feedback options through the use of clear and bright tri-colored LEDs configurable to support any three color combinations (RGB - Red, Green, and Blue).
   c. The multi-technology contactless smart card reader shall enable ease of installation through identical wiring methods as legacy 13.56 and 125 kHz proximity readers.
   d. The multi-technology contactless smart card reader shall enable backwards compatibility with legacy 13.56 MHz and 125 kHz proximity access control formats (E.g. 26-bit, 32, 35-bit, 37-bit, 56-bit, and HID Corporate 1000 formats).
   e. The multi-technology contactless smart card reader manufacturer shall provide a full product line of compatible products including readers, readers with integral keypads and, credentials and cards without the need of special programming.
   f. The multi-technology contactless smart card reader manufacturer shall provide global, off-the-shelf availability.
   g. The multi-technology contactless smart card reader shall provide universal compatibility with most access control systems by outputting card data in compliance with the SIA AC-01 Wiegand standard.
   h. Multi-technology contactless smart card reader shall be configurable to provide Clock-and-Data output.
   i. Multi-technology contactless smart card reader shall allow the reader firmware to be upgraded in the field without the need to remove the reader from the wall through the use of factory-provided Programming Cards.
   j. Multi-technology contactless smart card reader shall allow for secure installation practices through mounting methods utilizing tamper resistant screws.
   k. Multi-technology contactless smart card reader shall provide the ability to transmit an alarm signal via and integrated optical tamper switch if an attempt is made to remove the reader from the wall. The tamper switch shall be programmable to provide a selectable action to provide a selectable action compatible with various tamper communication schemes provided by access control panel manufacturers. The selectable action shall include one of the following:
      1) The reader open collector line changes from a high state (5V) to a low state (Ground).

2) During a tamper state, the “I’m Alive” message is inverted.

l. Multi-technology contactless smart card reader shall provide ability of an on-line “I’m Alive” message so the reader’s functional health can be monitored at all times when paired with a compatible access control panel.

m. The multi-technology contactless smart card reader shall provide customizable reader behavior options either from the factory, or defined in the field through the use of pre-configured command cards. Reader behavior programming options shall include:
   1) Audio/Visual Templates for card reads, proximity enabled, and attack detection.
   2) Velocity Check timing and thresholds
   3) 125 kHz ASK, FSK and PSK configurations and outputs
   4) Optical tamper actions
   5) RF scan delay
   6) Hold Mode
   7) Intelligent Power Management
   8) Key diversifiers
   9) Key rolling
   10) CSN output configuration
   11) Data Model prioritization
   12) Default LED color
   13) Hold mode

n. Multi-technology contactless smart card reader shall provide the following programmable audio/visual indication:
   1) An audio beeper shall provide various tone sequences to signify: access granted, access denied, power up, and diagnostics.
   2) A high-intensity red/green/blue (RGB) light bar shall provide clear visual status. The light bar shall provide uniform distribution of light eliminating individual bright spots.

o. The multi-technology contactless smart card reader shall provide the ability to upgrade its application code through the use of pre-configured firmware cards. This feature shall allow previously installed readers be reconfigured to modify their behavior and capabilities as the project environment evolves.

p. Multi-technology contactless smart card reader shall provide the ability for mounting to standard electrical boxes through the use of universal international mounting holes.

4. Multi-technology contactless smart card readers shall provide the following enhanced performance features

a. The multi-technology contactless smart card reader shall provide simultaneous support for 125 kHz proximity FSK (HID Proximity, AWID). PSK (Indala), and ASK (EM4102) 125 kHz technology to increase credential technology migration options.

b. The multi-technology contactless smart card reader shall enable user prioritization of High-frequency/High-frequency and High-frequency/Low-frequency credential reads. Technology prioritization shall synchronize a site’s credential technology read priority to the access panel configuration while reducing unintended credential reads.

c. The multi-technology contactless smart card reader shall have the ability to provide consistent optimal read range by implementing an auto-tune function that adjusts for manufacturing tolerances to enhance consistency of performance from reader to reader.

d. The multi-technology contactless smart card reader shall be field programmable to provide secure upgrades for migration and extended lifecycle.

e. The multi-technology contactless smart card reader shall be designed as a system to provide optimal read range and read speed for increased access control throughput.

5. Multi-technology contactless smart card reader shall provide enhanced environmental and sustainability features.
    a. The multi-technology contactless smart card reader shall reduce power consumption by as much as 75% through the use of Intelligent Power Management (IPM) technology.
    b. The multi-technology contactless smart card reader shall be manufactured with 10% recycled material to provide the potential of LEEDS building credits in new construction projects.
    c. Multi-technology contactless smart card reader shall be fully compliant with Restriction of Hazardous Substances directive (RoHS) restricting the use of specific hazardous materials found in electrical and electronic products. The substances banned under RoHS are lead (Pb), mercury (Hg), cadmium (Cd), hexavalent chromium (CrVI), polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE).
    d. Multi-technology contactless smart card reader shall be manufacturers with 11% (Pigtail) and 10% (Terminal Strip).
6. Multi-technology contactless smart card reader shall comply with the following 13.56MHz-related standards to ensure product compatibility and predictability of performance:
    a. SO 15693
    b. ISO 14443A
    c. ISO 14443B
7. Multi-technology contactless smart card reader shall implement the following high security 13.56 MHz applications out-of-box.
    a. Secure Identity Object on iCLASS SE
    b. Secure Identity Object on MIFARE Classic SE
    c. Secure Identity Object on MIFARE DESFire EV1 SE
8. Multi-technology contactless smart card reader shall be suitable for global deployment by meeting worldwide radio and safety regulatory compliance including:
    a. UL294 (US)
    b. FCC Certification (US)
9. Multi-technology contactless smart card reader shall be provided with a full potted assembly.
10. Multi-technology contactless smart card reader shall provide the following typical contactless read ranges:
    a. 3.0” (7.6 cm) reading SIO on iCLASS SE Card
    b. 1.5” (3.8 cm) reading SIO on MIFARE DESFire EV1 SE Card
    c. 2.3” (5.9 cm) reading SIO on MIFARE Classic SE Card
    d. 1.4” (3.6 cm) reading SIO on iCLASS SE Tag or Fob
    e. 0.9” (2.3 cm) reading SIO on MIFARE Classic SE Tag or Fob
    f. 2.7” (6.9 cm) reading 125 kHz HID Prox or AWID Card
    g. 1.0” (2.5 cm) reading 125 kHz Indala Card
    h. 2.0” (5.1 cm) reading 125 kHz EM4102 Card
    i. 0.8” (2.0 cm) reading 125 kHz HID Prox or AWID Tag or Fob
    j. 0.8” (2.0 cm) reading 125 kHz Indala Tag or Fob
    k. 0.8” (2.0 cm) reading 125 kHz EM4102 Tag or Fob
11. Multi-technology contactless smart card reader shall be designed for low current operation to enable contactless smart card migration from most legacy proximity applications without the need to replace existing access control panels and/or power supplies. Contactless smart card power requirements shall be:
    a. Operating voltage: 5 – 16 VDC, reverse voltage protected. Linear power supply recommended.
    b. Current requirements and power consumption:

1) 75 mA (Standard Power Mode)
2) 35 mA (Intelligent Power Management Mode)
3) 110 mA (Peak Current Draw)
4) 1.2 W (Standard Power Mode @ 16VDC)
5) 0.6 W (Intelligent Power Management Mode @ 16VDC)

12. Multi-technology contactless smart card reader shall meet the following physical specifications:
    a. Material: UL94 Polycarbonate
    b. Plastics: Consist of two-piece design with mounting plate and either separate front bezel and reader body (totaling three-pieces) or combined front bezel/reader body (totaling two-pieces).
    c. Color: Black or Charcoal Gray as approved by the project architect.
13. Multi-technology contactless smart card reader shall meet the following environmental specifications:
    a. Operating temperature: -31 to 150 degrees F (-35 to 65 degrees C)
    b. Operating humidity: 5% to 95% relative humidity non-condensing
    c. Weatherized design suitable to withstand harsh environments with a certified rating of IP55
14. Multi-technology contactless smart card reader cabling requirements shall be:
    a. Cable distance: (Wiegand or Clock & Data): 500 feet (150m)
    b. Cable type: 5-conductor #22 AWG (Shielded cable not required)
    c. Standard reader termination: 18” (0.5m) cable pigtail
    d. Optional reader termination: terminal strip
15. The multi-technology smart card reader shall be provisioned through secure connections utilizing Trusted Identity Platform’sTM Secure Delivery Infrastructure (SDI) where all cryptographic keys governing system security are delivered with end-to-end privacy and integrity.
16. The multi-technology contactless smart card reader shall provide a lifetime warranty against defects in materials and workmanship.
17. Multi-technology contactless smart card reader shall be HID Global multiclass **SE RP40**
18. Multi-technology contactless smart card reader shall be HID Global multiclass **SE RP10** (mullion mount)

2.6 WIRE AND CABLE

A. Card reader cable:
    1. Type: 7 conductor, 7-30 stranded, overall shielded cable
    2. Temperature range: -30 to +80 deg C.
    3. Shield: 100% coverage.
    4. Manufacturer (dry application):
        a. Belden. 9943
        b. West Penn 3263
        c. Alpha Wire Co. 1295 (Recommended by Mfr)
    5. Manufacturer (wet application):
        a. Belden (not catalogued)
        b. West Penn (not catalogued)
        c. Alpha Wire Co. (not catalogued)
            1) Direct burial: #35196.

2.7 SPARE PARTS

A. Software:
   1. Backup copy of all software.

B. Hardware:
   1. Card Readers: Two (1)
   2. Intelligent Network Controller: one (1)
   3. Access Control Modules: two (2) of each type used

PART 3 - EXECUTION

3.1 INSTALLATION (SEE SECTION 280510)

A. Programming of the system shall be provided. Control and/or reporting functions shall be coordinated with the hardware requirements and with the owner selected options.

B. Enter all database items, system configurations, informational lists, descriptors and any other system data. Submit forms required to be filled out and request information three (3) months prior to the need of this information from the owner for the completion of system data entry.

C. Allow 4 hours of meeting with owner representative prior to programming for verification of operational intent.

3.2 WIRING (SEE SECTION 280510)

3.3 OWNER PERSONNEL TRAINING (SEE SECTION 280510)

A. Provide laminated card with commonly used operator instructions. Locate at Workstation. Provide two copies.

B. Training Outline-Operational staff
   1. Functions performed
   2. Acknowledgement/Responses
   3. Control Functions
   4. Software Overview
   5. Card authorization and deletion

C. Training Outline-Maintenance Staff
   1. System Operation
   2. Component Review
   3. Routine Maintenance/Adjustments
   4. Troubleshooting/Repair
   5. Expansion Capabilities

END OF SECTION

SECTION 282300

VIDEO MANAGEMENT AND RECORDING SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. General:
1. Furnish all labor, materials, tools, equipment, and services for all video surveillance systems as indicated, in accordance with provisions of Contract Documents.
2. Completely coordinate with work of all other trades.
3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
4. See Section 280510 for Electronic Systems General Requirements.
5. See Division 1 for General Requirements.

B. Related work:

1. Cabinets and Enclosures:	Section 280555
2. Access Control System:	Section 281300
3. Electronic Control System:	Section 284619
4. Touch Screen Control and Management System:	Section 284623
5. Digital Intercom and Paging System:	Section 285123
6. Uninterruptible Power System:	Section 285045

1.2 BASIS OF DESIGN

A. The purpose of video management and recording system is to provide visual confirmation of movement through security barriers and general surveillance of movement. The Video Management and recording System shall be an IP network-based, fully distributed digital video system. The security video system will utilize local area networks (LAN) as a transmission medium for video, configuration, as well as storage of all data. The IP video management system shall provide support for IP cameras from multiple manufacturers and shall support standard resolution and megapixel HD IP cameras. Network Storage shall be configured using fault-tolerant RAID-6 drive arrays.

B. The video management system shall be an IP network-based, fully distributed digital video system that will be provided by the electronic security system integrator/contractor. The security video system will utilize local area networks (LAN) as a transmission medium for video, configuration, as well as storage of all data. The security video system shall provide full video control at the Mono County Jail, with additional full selection capability at any point within the network from any workstation or a video console display. The security video system shall provide unlimited expansion capability for the addition or modification of video inputs. The purpose of the video surveillance system is to provide visual confirmation of movement through security barriers and general surveillance of movement. The digital, high resolution IP video cameras will be used throughout the building and around the building perimeter. High resolution cameras will be mounted outside each perimeter access control door to provide the necessary verification of all activity at the entrance. Video IP cameras will be in all areas of the building that require

monitoring for reasons of security. All cameras shall be recorded and video storage shall be sized to retain recording for 365 days. All cameras shall be continuously recorded at native resolution, 15 images per second. Quite time recording (no motion) shall be native resolution, 2 images per second for all cameras. The motion should be estimated at 70%. Miscellaneous devices (i.e. motion detectors, call buttons, duress buttons, and etc.) shall be configured as inputs to the local PLC with status displayed on the control stations.

C. The system shall permit normal and event monitoring of all secured areas on monitors as shown in the specifications and drawings. Video monitoring consoles shall be installed as shown on the drawings and described in these specifications. In all cases, the equipment shall be state of the art, standardized commercial off-the-shelf, and modular. In all cases, the method of communication from remote locations within the network to the central components shall be transparent to the user. Equipment shall be selected and installed so repairs may be accomplished on site by module replacement, utilizing spare components whenever possible.

D. The Contractor shall furnish and install all security video cameras, mounts, housings, power supplies, network cables, connectors, equipment racks, monitors and consoles, computer controlled network switches, work stations, network storage, encoders, decoders, video console displays and all other hardware and software to provide a fully operational system.

E. All licensing for cameras and software shall be included and no recurring license fees shall apply. The software shall allow the owner to replace cameras without additional license fees or software upgrade fees for the life of the system.

F. The video management and recording system specified is an enterprise-class client/server based IP video security solution that provides seamless management of digital video, audio and data across an IP network. The system is designed to work with CCTV and ONVIF compliant 3rd party products as part of a total video security management system to provide full virtual matrix switching and control capability. Cameras, recorders, and viewing stations may be placed anywhere in the IP network.

G. The system shall provide multi-level diagnostics of each component in all critical areas. These diagnostics shall be reported to a diagnostic console for processing. In addition, the diagnostic data shall be capable of being scripted into actionable events within the system.

H. The system shall be able to handle future expansion of an unlimited total capacity from what is shown in the drawings, including but not limited to cameras, monitors, workstations and keyboards.

I. The system shall be installed by a certified dealer/integrator. Certification for installation shall be conducted by the manufacturer and shall provide all necessary knowledge to fulfill the systemization and deployment across diverse networks and infrastructures, as well as provide commissioning abilities at the integrator level.

J. All the cameras shall be mounted within housings suitable for the environment in which they are placed.

K. Each typical camera mounting location shall be field verified to confirm best video coverage. Video coverage shall be approved either by the owner or the design engineer.

L. Provide user-programmable twelve-character title for each camera.

1.3 QUALITY ASSURANCE (SEE SECTION 280510)

A. Work shall be performed in accordance with the applicable national and local codes or standards current at the commencement of installation. The following list summarizes applicable standards:
   1. National Electrical Safety Code, current edition.
   2. National Fire Protection Association National Fire Codes, current edition.
   3. EIA/TIA – 568: Commercial Building Telecommunications Wiring Standard.
   4. EIA/TIA – 569: Commercial Building Standard for Telecommunications Pathways and Spaces.
   5. EIA/TIA – 606: Administrative Standards for the Telecommunications Infrastructure of Commercial Buildings.
   6. IEEE, RS 170 Variable Standard.
   7. IEEE 802.3 digital data network standard.
   8. Premises cabling standard EIT/TIA568A.
   9. Member, MPEG-4 Industry Forum
   10. Member, Universal Plug and Play (UPnP) Forum
   11. Member, Universal Serial Bus (USP) Implementers Forum
   12. Compliance, ISO/IEC 14496 standard (also known as MPEG-4)

B. Where more than one code or regulation is applicable, the more stringent regulation shall apply.

1.4 SUBMITTALS (SEE SECTION 28 0510)

A. Video Surveillance System 28 2300
   1. Project data: Description of system operation indicating purpose and capabilities of each component of system with functional system diagram indicating all interfaces to other systems. Description shall include, and call attention to, all variances from the contract documents.
   2. Shop drawings: Complete installation drawings including system diagrams and terminal point to terminal point wiring diagrams or schedules.
   3. Product data: Technical data sheets and specifications for each and every component.
   4. Storage Calculations: To ensure that adequate storage is available to meet the specification requirements.
   5. Bandwidth Calculations: To ensure that adequate bandwidth is available to support the full functionality of any camera, any recorder and any viewing station.

1.5 WARRANTY (SEE DIVISION 1)

1.6 OPERATING AND MAINTENANCE DATA (SEE SECTION 28 0510)

1.7 VIDEO MANAGEMENT SYSTEM CAPABILITIES

A. The video management system (VMS) specified is an enterprise-class client/server based IP video security solution that provides seamless management of digital video, audio and data across an IP network. The video management system is designed to work with CCTV and ONVIF compliant 3rd party products as part of a total video security management system to provide full virtual matrix switching and control capability. Cameras, recorders, and viewing stations may be placed anywhere in the IP network.

B. The VMS shall be capable to be deployed in Local Area Networks (LAN) as well as in Wide Area Networks (WAN). For establishing remote connections across WAN, it shall be possible to setup a port mapping table within the configuration manager in order to map the public port to a private IP and port of the devices.

C. The VMS shall provide a built-in command script editor that allows customized command scripts to be written to control virtually all the system functions.

D. The VMS shall be built upon open, industry standards and facilitate integration with IT infrastructures and other digital and analog systems.

E. The IP video management system shall have no restriction as to the resolution, frame rate, or number of standard resolution or mega pixel cameras that can be recorded, viewed, and managed on the system.

F. All displays shall retain the camera's aspect ratio and accommodate 4:3, 16:9, or 16:10 monitor displays.

G. Multiple users shall be able to simultaneously view the same camera view or sequence. The system shall support multicast streaming video to allow multiple users to view the same video stream, though not necessarily synchronized with each other, without affecting the bandwidth of the network.

H. The VMS shall allow for programming of alarms and associated incoming alarms with related parts of the system. Alarms and other triggers can be grouped into system events.

I. The VMS shall log all alarms and events in the database.

J. The VMS shall provide for virtual matrix functionality, leveraging the IP network to switch any camera to any monitor either through a PC Keyboard/Mouse or a joystick controller as well as transmit alarms and other system messages to any console on the network.

K. The VMS shall be designed in such a way that configuration changes to any part of the system shall not interrupt operational tasks, until the operator decides to update re-fresh the workstation configuration.

L. The VMS shall be able to handle future expansion of an unlimited total capacity from what is shown in the drawings, including but not limited to cameras, monitors, workstations and keyboards.

M. The IP video management system network shall be arranged so each area will operate independently and shall communicate via a 10Giga-bit network at a minimum to the server. The system shall utilize virtual matrix switcher capabilities through the use of a server. The server shall provide a user interface and database management of the VMS. The server shall allow for users to be restricted via software to logical configurable groups of cameras, monitors and system operations

PART 2 - PRODUCTS

2.1 OPERATING AND MAINTENANCE DATA (SEE SECTION 280510)

2.2 GENERAL

A. Manufacturers:
   1. Video management and recording software:
      a. Avigilon
      b. Bosch
      c. Genetec
      d. Hanwha
      e. Milestone
      f. Pelco
   2. Video surveillance cameras:
      a. Avigilon
      b. Axis
      c. Bosch
      d. Hanwha
      e. Pelco
   3. CAT6 cable and Fiber Optic cable
      a. Base: Belden, West Penn, Comm/Scope, Inc.
   4. Video Management and Recording Servers:
      a. Dell
      b. HP - Hewlett-Packard
   5. Video Management Workstations:
      a. Dell
      b. HP - Hewlett-Packard
   6. Network Switch:
      a. Base: L2/L3 – CISCO
   7. The product numbers contained herein are for reference only and may not be the most current available nor a complete listing of all features or options required. Where a manufacturer is listed without a product number, an equivalent item of the specified manufacturer is acceptable. Determination of equivalent is at the sole discretion of the Engineer. Where a conflict or ambiguity exists between the written description and the product number, the written description shall govern.
   8. Video products listed in this specification section are based on Bosch product numbers, performance and technical characteristics. Manufacturers listed in this spec section with products that have the same or better technical characteristics and performance will be acceptable.
   9. Other manufacturers desiring approval comply with Division 1.

B. System Operation:
   1. Provide complete system for viewing of remote scene including control of equipment accessories.
   2. Provide all programming of system as indicated herein.
   3. Video Surveillance Automated Call-Up:
      a. The video surveillance system shall be configured for automatic camera viewing on selected intercom calls and alarms upon acknowledgment by the control operator.
         1) When an intercom call or alarm is acknowledged, the camera viewing the device shall be displayed as indicated in the camera schedule.
         2) Intercom calls shall call up the camera viewing the intercom station.
         3) Door alarms shall call up the camera viewing.

4) Panic/Duress activation shall call up the camera viewing the area of the alarm. If a camera is not available for such, call up cameras on entry to area.
5) Card Readers activation shall call up the camera viewing the area.
6) All call-ups shall be reviewed and revised as needed during the submittals.

b. Camera display shall reset upon the reset of the intercom, card reader or alarm.

2.3 VIDEO ANALYTICS

A. Provide state-of-the-art intelligent video analysis that reliably detects, tracks, and analyzes moving objects while suppressing unwanted alarms from spurious sources in the image.

B. Cameras shall be capable of processing and analyzing video within the camera itself, with no extra hardware required.

C. VMS shall record metadata so analytics can be used on recorded video without having been setup for live video.

D. Analytics shall intelligently adapt to difficult conditions like changes in lighting or environment such as rain, snow, clouds, and leaves blowing in the wind. The built-in tamper detection generates alarms on camera hooding/masking, blinding, defocusing, and repositioning.

E. Analytics shall include
1. Detect objects within, entering, or leaving an area
2. Detect multiple line crossing from single line up to three lines combines in a logical row
3. Detect objects traversing a route
4. Detect loitering in an area related to radius and time
5. Detect objects which are idle for a predefined tine span
6. Detect removed objects
7. Detect objects who's properties such as size, speed, direction, and aspect ratio change within a configured time span according to specification (for example something falling down)
8. Count objects crossing virtual line or entering a certain area
9. Overhead people counting (Bird's eye view)
10. Detect a certain crowd level in a predefined field
11. Detect specified motion direction and speed even in crowds (for example a person moving the wrong way in a one-way gate)
12. Detect objects that move contrary to the motion of all other objects in the scene, even in crowds
13. Take snapshots of frontal faces
14. Combine tasks using scripts

F. To enhance robustness, analytics shall be capable of being configured to ignore specified image areas and small objects. Calibrated cameras shall automatically distinguish between upright persons, bikes, cars, and trucks. Furthermore, object size, speed, two-way direction, aspect ratio, and color filters shall be available for use in any combination to create specific detection rules for exactly the objects you are looking for. Statistics on object properties shall be stored and capable of being displayed for fine tuning the object filters. Object properties shall also be able to be defined by selecting an appropriately similar object in the video.

G. Cameras specified and listed in the camera schedule with analytic requirements shall include all of these capabilities without any licenses for individual features and functions.

2.4 1080P MINIDOME CAMERAS

A. The Vandal resistant 1080P camera shall have a microSD card slot that uses standard; off-the-shelf microSD (SDHC and SDXC) cards for local storage (up to 2 TB) and be enclosed in a cast-aluminum housing with an aluminum trim ring and a clear polycarbonate dome bubble (with UV blocking anti-scratch coating) and be capable of operating in an indoor or an outdoor environment. The camera shall conform to the ONVIF Profile S and G standards

B. Image Sensor: 1/2.8-inch CMOS HD image sensor.

C. Lens: 3-9mm motorized automatic zoom and focus (remote varifocal), super resolution lenses with an advanced iris design. Horizontal field of view shall be 37 to 106 degrees and vertical field of view shall be 21 to 55 degrees minimum.

D. Camera processing latency: <55 ms

E. Dynamic Range: 146 dB HDR

F. Compression: H.265 MP, H.264 MP, M-JPEG

G. Audio
   1. Standard:
      a. AAC
      b. G.711, 8 kHz sampling rate
      c. L16, 16 kHz sampling rate
   2. Signal-to-Noise Ratio: >50 dB
   3. Audio Streaming: Full duplex / Half duplex

H. Light sensitivity (based on 3100K, Scene Reflectivity 89%, 1/25, F1.4, 30 IRE)
   1. Starlight mode:
      a. Color: 0.0225 lx
      b. Monochrome: 0.0051 lx

I. Content-based Imaging Technology (C-BIT) and Intelligent Dynamic Noise Reduction (iDNR) technology to reduce the bitrate and storage requirements by removing noise artifacts.

J. Resolution: 1920 x 1080 pixels (HD 1080p) at 60 ips with a 16:9 image format.

K. Network:
   1. Protocols: IPv4, IPv6, UDP, TCP, HTTP, HTTPS, RTP/RTCP, IGMP V2/V3, ICMP, ICMPv6, RTSP, FTP, Telnet, ARP, DHCP, SNTP, SNMP (V1, MIB-II), 802.1x, DNS, DNSv6, DDNS, SMTP, iSCSI, UPnP (SSDP), DiffServ (QoS), LLDP, SOAP, Dropbox, CHAP, Digest Authentication.
   2. Encryption: TLS 1.0, SSL, AES (optional)
   3. Ethernet: STP, 10/100 Base-T, auto-sensing, half/full duplex, RJ45
   4. PoE Supply: IEEE 802.3at Type-2 compliant

L. Connectivity:
   1. ONVIF Profile S
   2. Auto-MDIX

M. Edge Essential Video Analytics
   1. Configurations:

a. Silent VCA / Profile1/2 / Scheduled / Event Triggered
2. Alarm rules (combinable):
a. Any object / Object in Field / Line Crossing / Enter/Leave field / Loitering / Follow route / idle/remove object / Counting / Occupancy / Crowd density estimation / Condition change / similarity search

N. Operating Temperature: -30°C to +50°C (-22°F to 122°F)

O. Cold Start Temperature: -20°C (-4°F)

P. Operating Humidity: 5% to 93% relative humidity

Q. Water/Dust Protection: IP66 and NEMA Type 4X

R. Impact Protection: IK10

S. Model:
1. Avigilon 2.0C-H6SL-D01-IR series with mounting accessories as required
2. Axis P3265-LVE series with mounting accessories as required
3. Bosch NDE-4512-A series with mounting accessories as required
4. Hanwha XNV-6083R series with mounting accessories as required
5. Pelco

2.5 MAXIMUM SECURITY CELL CORNER CAMERA (4MP)

A. The ruggedized, vandal resistant MP POE camera shall be a corner mount, no-grip design with a microSD card slot that uses standard; off-the-shelf microSD (SDHC and SDXC) cards for local storage (up to 2 TB) and be enclosed in a cast-aluminum housing. Ii shall be able to view the entire floor and all four walls of a 15 foot square room, including the two walls to which it is attached and have a night-time IR monochrome mode and built in microphone and IR illuminators.

B. Image Sensor: 1/1.8-inch CMOS MP image sensor with mechanical filter technology for vivid daytime color and effective night-time performance under infrared illumination.

C. Lens: 2.5 mm allowing a full 131º H-FoV and 96º V-FoV of the entire room.

D. Camera processing latency: <55 ms

E. Dynamic Range: 120 dB

F. Audio
1. Standard:
a. AAC
b. G.711, 8 kHz sampling rate
c. L16, 16 kHz sampling rate
2. Signal-to-Noise Ratio: >50 dB
3. Audio input: Built in Microphone and Line Level In
4. Audio output: Line out
5. Audio Streaming: Full duplex / Half duplex

G. Light sensitivity (based on 3200K, Scene Reflectivity 89%, 30 IRE)
   1. Color: 0.090 lx
   2. Monochrome: 0.0 lx (IR on)

H. Content-based Imaging Technology (C-BIT) and Intelligent Dynamic Noise Reduction (iDNR) technology to reduce the bitrate and storage requirements by removing noise artifacts.

I. Resolution: 2816X2112 (6 MP) sensor with (16:9) and (4:3) at 30 FPS.

J. IR Illumination: 940nm IR LED's with Smart IR for sensitivity adjustment

K. Network:
   1. Protocols: IPv4, IPv6, UDP, TCP, HTTP, HTTPS, RTP, IGMP V2/V3, ICMP, RTSP, FTP, Telnet, ARP, DHCP, SNTP, SNMP (V1, MIB‑II), 802.1x, SMTP, iSCSI, UPnP (SSDP)
   2. Encryption: The camera shall offer three levels of password protection, support 802.1x authentication using a RADIUS (Remote Authentication Dial In User Service) server, store a SSL certificate for use with HTTPS, and be capable of being independently AES encrypted with 128-bit keys.
   3. Ethernet: STP, 10/100 Base-T, auto-sensing, half/full duplex, RJ45
   4. PoE Supply: IEEE 802.3af Type-1 compliant

L. Connectivity:
   1. ONVIF Profile S, G, M, T
   2. Auto-MDIX

M. Intelligent Video Analytics Pro (IVA Pro)
   1. Configurations:
      a. Silent VCA / Profile1/2 / Scheduled / Event Triggered
   2. Alarm rules (combinable):
      a. Any object / Object in Field / Line Crossing / Enter/Leave field / Loitering / Follow route / idle/remove object / Counting / Occupancy / Crowd density estimation / Condition change / similarity search

N. Operating Temperature: -10°C to +50°C (14°F to 122°F)

O. Operating Humidity: 5% to 93% relative humidity

P. Water/Dust Protection: IP66

Q. Impact Protection: IK10+

R. Model:
   1. Avigilon 5.0C-H5A-CR1-IR (5MP) series with mounting accessories as required
   2. Axis Q9216-SLV (4MP) series with mounting accessories as required
   3. Bosch NCE-7703-FK (6MP) series with mounting accessories as required
   4. Hanwha TNV-8011C (5MP) series with mounting accessories as required
   5. Pelco IBD532-1 (5MP) series with mounting accessories as required

2.6 5MP MINIDOME CAMERAS

A. The Vandal resistant 5MP camera shall have a microSD card slot that uses standard; off-the-shelf microSD (SDHC and SDXC) cards for local storage (up to 2 TB) and be enclosed in a cast-

aluminum housing with an aluminum trim ring and a clear polycarbonate dome bubble (with UV blocking anti-scratch coating) and be capable of operating in an indoor or an outdoor environment.

B. Image Sensor: 1/2.7-inch CMOS image sensor.

C. Lens: 3.2-10.5mm motorized automatic zoom and focus (remote varifocal) lens with an advanced iris design. Horizontal field of view shall be 29 to 96 degrees and vertical field of view shall be 22 to 71 degrees minimum.

D. Camera processing latency: <55 ms

E. Dynamic Range: 120 dB HDR

F. Compression: H.265 MP, H.264 MP, M-JPEG

G. Audio
   1. Standard:
      a. AAC
      b. G.711, 8 kHz sampling rate
      c. L16, 16 kHz sampling rate
   2. Signal-to-Noise Ratio: >50 dB
   3. Audio Streaming: Full duplex / Half duplex

H. Light sensitivity (measured according to IEC 62676 Part 5 (1/25, F1.6):
   1. Color: 0.060 lx
   2. Monochrome: 0.012lx

I. Content-based Imaging Technology (C-BIT), Intelligent streaming and Intelligent Dynamic Noise Reduction (iDNR) technology to reduce the bitrate and storage requirements by removing noise artifacts.

J. Resolution: 2688X1944 pixels (MP 5MP) at 30 fps with a 4:3 image format, 2592X1456 pixels (MP 3.8MP) at 30 fps with a 16:9 image format, and 1920 x 1080 (HD 1080P) at 30 fps with a 16:9 image format.

K. Network:
   1. Protocols: IPv4, IPv6, UDP, TCP, HTTP, HTTPS, RTP/RTCP, IGMP V2/V3, ICMP, ICMPv6, RTSP, FTP, Telnet, ARP, DHCP, SNTP, SNMP (V1, MIB‑II), 802.1x, DNS, DNSv6, DDNS, SMTP, iSCSI, UPnP (SSDP), DiffServ (QoS), LLDP, SOAP, Dropbox, CHAP, Digest Authentication.
   2. Encryption: AES with 256-bit keys, RSA, HTTPS
   3. Ethernet: STP, 10/100 Base-T, auto-sensing, half/full duplex, RJ45
   4. PoE Supply: IEEE 802.3af compliant

L. Connectivity:
   1. ONVIF Profile S, G, T and M
   2. Auto-MDIX

M. Intelligent Video Analytics Pro (IVA Pro)
   1. Configurations:
      a. Silent VCA / Profile1/2 / Scheduled / Event Triggered

2. Alarm rules (combinable):
   a. Any object / Object in Field / Line Crossing / Enter/Leave field / Loitering / Follow route / idle/remove object / Counting / Occupancy / Crowd density estimation / Condition change / similarity search

N. Operating Temperature: -40°C to +55°C (-40°F to 131°F)

O. Operating Humidity: 0% to 90% relative humidity

P. Water Protection: IP66

Q. Impact Protection: IK10

R. Model:
1. Avigilon 5.0C-H6SL-D01-IR series with mounting accessories as required
2. Axis P3267-LVE series with mounting accessories as required
3. Bosch NDE-5703-A series with mounting accessories as required
4. Hanwha XNV-8083R series with mounting accessories as required
5. Pelco SRXP4-5V10-EMD series with mounting accessories as required

2.7 12MP 180/360 DEGREE PANORAMIC CAMERA

1. The panoramic camera shall be vandal rated and capable of operating in an indoor and an outdoor environment, offer Content-based Imaging Technology (CBIT), utilize Intelligent Dynamic Noise Reduction (iDNR) technology to reduce the bitrate and storage requirements by removing noise artifacts, accept power via Power over Ethernet (IEEE 802.3af compliant), and offer Intelligent Video Analysis (IVA) as well as audio AI and audio analytics..
2. The camera shall offer a 1/2.3-inch CMOS image sensor, 12MP sensor.
3. The camera shall provide direct network connection, allow full camera control and configuration capabilities over the network, be capable of capturing and storing images using the following compression standards:
   a. H.265
   b. H.264
   c. M-JPEG
4. The camera shall deliver video over a 10/100 Base-T, auto-sensing, half/full duplex, RJ45 Ethernet connection, comply with the IEEE 802.3af
5. The camera shall be capable of processing and analyzing video within the camera itself, with no extra hardware required, be capable of detecting and sending alarms for abnormal events, and allow users to set up separate profiles, and switch profiles based on day/night or holiday schedules.
6. The camera shall offer three levels of password protection, support 802.1x authentication using a RADIUS (Remote Authentication Dial In User Service) server, store a SSL certificate for use with HTTPS, and shall support RSA encryption key lengths of up to 4096 bits.
7. The camera shall support iSCSI devices to allow video stream to be recorded directly to an iSCSI RAID array, support iSCSI storage targets to enable the camera to function as a conventional DVR, have a microSD card slot that uses standard; off-the-shelf microSD (SDHC and SDXC) cards for local storage (up to 2 TB), and the local storage feature shall be capable of storage for Automatic Network Replenishment (ANR).
8. The camera shall have an integrated microphone array with 3 microphones, offer two-way, full duplex audio communication, and offer G.711, AAC and L16 audio compression (live and recording).

9. The camera shall offer full 360 degree panoramic surveillance using 3008 X 3008 effective picture elements.
10. High Dynamic Range of 120 dB for clear images in extreme high-contrast environments.
11. Built-in IR illumination.
12. Light sensitivity
    a. Color: 0.150 lx
    b. Monochrome: 0.048 lx
13. The camera shall be ONVIF Profile S, G, M and T compliant to allow integration with third-party client-side dewarping software.
14. Intelligent Video Analytics
    a. Configurations:
        1) Silent VCA / Profile1/2 / Scheduled / Event Triggered
    b. Alarm rules (combinable):
        1) Any object / Object in Field / Line Crossing / Enter/Leave field / Loitering / Follow route / idle/remove object / Counting / Occupancy / Crowd density estimation / Condition change / similarity search / flow /conditional change
15. IP66 weatherproof rating and IK10 vandal resistance rating.
16. Operating Temperature: -40°C to +50°C (-40°F to 122°F)

B. Model:
1. Avigilon 12.0W-H5A-FE-D01-IR series with mounting accessories as required
2. Axis M4328-P series with mounting accessories as required
3. Bosch NDS-5704-F360LE series with mounting accessories as required
4. Hanwha XNF-9010RV series with mounting accessories as required
5. Pelco 12MP-IMF122-1ERS series with mounting accessories as required

2.8 20MP MULTI-SENSOR ADJUSTABLE CAMERA

1. The multi-sensor adjustable dome network camera shall be outdoor (IP66) and vandal rated (IK10) and capable of operating in an indoor and an outdoor environment, capture very high quality images with a total resolution of 20MP via four independent 5MP CMOS sensors, require a single IP address, accept power via Power over Ethernet (POE+), contain a built-in microphone, and incorporate built-in intelligent Video Analytics capability.
2. The camera shall offer 4X CMOS image sensor, 5MP sensor pixels.
3. The camera shall provide direct network connection, allow full camera control and configuration capabilities over the network, be capable of capturing and storing images using the following compression standards:
    a. H.264 (Baseline)
    b. H.265 (Baseline)
    c. MJPEG
4. The camera shall deliver video over a 10/100 Base-T, auto-sensing, half/full duplex, RJ45 Ethernet connection.
5. The camera shall be capable of processing and analyzing video within the camera itself, with no extra hardware required, be capable of detecting and sending alarms for abnormal events, and allow users to set up separate profiles, and switch profiles based on day/night or holiday schedules.
6. The camera shall offer password protection, support IEEE 802.1x authentication, and store a SSL certificate for use with HTTPS.
7. The camera shall have an integrated microphone and offer two-way bi-directional audio communication.

8. The camera shall provide four images that enable 360 degree coverage capturing images from every angle for comprehensive video coverage with 4 separate views from a single IP address.
9. Maximum frame rate: 30 FPS
10. Lens: 3.7 to 7.7mm, F1.9 with viewing angle of 88.8 to 40.2 H and 59.8 to 28.6 V
11. Light sensitivity: 0.095 lx in color mode and 0.005 lx in monochrome mode
12. Dynamic range: 120dB
13. Edge Storage: via SD/SDHC memory card (sold separately)
14. The camera shall be ONVIF Profile S and G compliant.
15. IP66 weatherproof rating and IK10 vandal resistance rating.
16. Operating Temperature: -40°C to +50°C (-40°F to 122°F)

B. Model:
1. Avigilon 20C-H5A-4MH series with mounting accessories as required.
2. Axis P3719-PLE series with mounting accessories as required.
3. Bosch NDM-7703-A series with mounting accessories as required.
4. Hanwha PNM-9085RQZ series with mounting accessories as required.
5. Pelco SMLE1-20V5-4H series with mounting accessories as required.

2.9 20MP 360 DEGREE MULTI-DIRECTIONAL MULTI-SENSOR CAMERA WITH PTZ ACCESSORY

A. With four 5 MP sensors, this model provides a complete 360° overview with great image usability both day and night. Designed for operation with any AXIS Q60-E PTZ Network Camera, it enables one-click PTZ control and autopilot for automatic PTZ tracking within the viewing areas. And, each sensor has exchangeable lenses with autofocus and positioning calibration for maximum flexibility and accurate configuration. AXIS Q6010-E uses the same bracket, power supply and network cable as the connected AXIS Q60-E PTZ Network Camera for cost-efficient installation. Furthermore, Zipstream with support for H.264/H.265 significantly lowers bandwidth and storage requirements without compromising image quality.Image Sensor: (4x) 1/2.5-inch progressive scan RGB CMOS sensors.

B. Lens:
1. Autofocus lenses, fixed iris, 2.8 mm, F2.0
2. 4 x 5MP progressive scan RGB CMOS 1/2.5 mm
3. Horizontal field of view: 360°
4. Vertical field of view: 84°

C. Day and night:
1. Automatically removable infrared-cut filter

D. Minimum illumination:
1. Color: 0.4 lux at 50 IRE F1.8
2. B/W: 0.03 lux at 50 IRE F2.0

E. Video compression:
1. H.264 (MPEG-4 Part 10/AVC) Baseline, Main and High Profiles
2. H.265 (MPEG-H Part 2/HEVC) Main Profile

F. Resolution:
1. 4 x 2592x1944 to 320x240
2. Panorama: 3904-x800 or 2560x2080

G. Frame rate:
   1. Up to 20 fps (50/60 Hz) in all resolutions

H. Video Streaming:
   1. Multiple, individually configurable streams in H.264, H.265 and Motion JPEG
   2. Controllable frame rate and bandwidth
   3. MBR H.264/H2.65

I. IP Address
   1. Assignable on host PTZ

J. Application Programing Interface:
   1. ONVIF Profile S, G, T

K. Video Analytics
   1. Configurations:
      a. Included: Directional audio detection, Autopilot, AXIS Video Motion Detection, AXIS Guard Suite including AXIS Motion Guard, AXIS Fence Guard, and AXIS Loitering Guard, active tampering alarm, edge storage events
      b. Support for installation of third-party applications.

L. Casing:
   1. IP66-, NEMA 4X-rated, IK10
   2. Aluminium casing with polycarbonate hard-coated dome

M. Power:
   1. Consumption without PTZ: PoE typical 9 W, max 23 W

N. Connectors:
   1. RJ45 10BASE-T/100BASE-TX/1000BASE-T PoE
   2. RJ45 10BASE-T/100BASE-TX/1000BASE-T Q61-E port

O. Storage:
   1. Support for microSD/microSDHC/microSDXC card and encryption
   2. Recording to network-attached storage (NAS)

P. Operating conditions:
   1. -50 °C to 50 °C (-58 °F to 122 °F) w/ heater kit
   2. -40 °C to 50 °C (-40 °F to 122 °F)

Q. Model:
   1. Axis Q6100-E and Axis Q6135-LE (PTZ)
   2. Hanwha PNM-9322VQP Series with (4X5MP)

2.10 27-INCH HIGH PERFORMANCE HD LED MONITOR

A. Video
   1. The HD monitor shall support Full HD 1080p resolution (1920 x 1080), feature a 3-D comb filter, have performance-enhancing features such as picture-in-picture, picture-and-picture, menu controls to adjust video features, and automatic detection of a NTSC signal,

and display images using an aspect ratio of 16:9 and be capable of displaying 16.7 million colors.

B. Electrical/Mechanical
   1. Main Supply Input Voltage: 100–230 VAC, 50/60 Hz
   2. Monitor Input Voltage/Power Requirements: 90–264 VAC, 50/60 Hz
   3. Power at Rated Voltage:
      a. Operation: 260 W
      b. Standby: 10 W
   4. The HD monitor shall conform to the 130 x 130 mm VESA Mounting standard.

C. Video:
   1. Sync Format: NTSC
   2. LCD Panel: Active Matrix TFT LCD
   3. Viewable Picture Area: 27 in, measured diagonally
   4. Pixel Pitch (H x V): 0.4845 x 0.4845 mm
   5. Resolution: 1920 x 1080 pixels
   6. Aspect Ratio: 16:9
   7. Display Colors: 8 bit interface; 16.7 million colors
   8. Response Time: <8 milliseconds
   9. Backlight:
      a. Twenty (20) cold cathode fluorescent tubes
      b. Rated Life: 50,000 hours

D. Optical Characteristics
   1. Luminance: 500 cd/m^2, anti-glare, hard-coating (3H) treatment
   2. Contrast Ratio: 800:1 (typical)
   3. Viewing Angle:
      a. Horizontal: 178°
      b. Vertical: 178°

E. Connectors
   1. Video: Four (4) BNC types (2 in, 2 out)
   2. RGB: One (1) 15-pin D-sub
   3. Y/C (S-video): Two (2) (1 in, 1 out)
   4. Component: Y, Pb, Pr
   5. Audio:
      a. Four (4) RCA type (2 stereo inputs)
      b. One (1) PC stereo input
      c. One (1) looping output, 1/8 in. mini phono plug
   6. Digital:
      a. One (1) DVI-D
      b. One (1) HDMI
   7. Power Cord: Two 3-wire with a grounded plug, 1.8 m (6 ft) long.

F. Mechanical:
   1. Dimensions:
      a. Monitor Only: 685 x 422 x 120 mm (27 x 16.6 x 4.7 in.)
   2. Weight:
      a. Monitor Weight: 22 kg (47.6 lbs)

G. Environmental:

1. Operating Temperature: 10° to 40°C (50° to 104°F)
2. Storage Temperature: -20° to +50°C (-4° to 122°F)
3. Humidity: Maximum 90%, non-condensing

H. Model:
1. Bosch UML-275-90 with appropriate mount
2. Pelco
3. Or EQUAL

2.11 65-INCH HIGH PERFORMANCE HD LCD MONITOR

A. Video
1. The 4K monitor shall support Full 4K resolution (3840 x 2160), an LED backlight panel, shall automatically focus on setting the correct color, temperature, and gamma curve settings, shall display images using an aspect ratio of 16:9 and be capable of displaying 1.07 billion colors.

B. Electrical/Mechanical
1. Main Supply Input Voltage: 100–230 VAC, 50/60 Hz
2. Monitor Input Voltage/Power Requirements: 90–264 VAC, 50/60
3. Power at Rated Voltage:
   a. Operation: <155 W
   b. Standby: <0.5 W
4. The 4K monitor shall conform to the 400 x 200mm and 400 x 400mm VESA Mounting standard.

C. Video:
1. Sync Format: PAL/NTSC
2. Display Panel: LED
3. Viewable Picture Area: 55. in, measured diagonally
4. Resolution: 3840 x 2160 pixels
5. Aspect Ratio: 16:9
6. Display Colors: 1.07 billion
7. Response Time: 6.5 milliseconds (typical)
8. Backlight: 50,000 hours

D. Optical Characteristics
1. Luminance: 450 cd/m2luminance.
2. Contrast Ratio: 4,000:1
3. Viewing Angle:
   a. Horizontal: 178°
   b. Vertical: 178°

E. Connectors
1. One DiplayPort
2. One digital DVI-D input.
3. Two digital HDMI input.
4. One analog RGB (VGA) input.
5. One 100-240 VAC power input.
6. Audio:
   a. Two RCA audio inputs (left/right).

b. One phono jack input.
c. One RCA audio output (left/right).
d. One speaker output.

F. Mechanical:
1. Cabinet Material: SECC
2. Finish: Black
3. Mount: Wall mounting compatible with standard bracket
4. VESA Mounting Compliance: 400 x 400 mm
5. Dimensions: 57.11 x 32.6 x 3.09 in.
6. Weight: 30.5 kg (67.2 lb)

G. Environmental:
1. Operating Temperature: 0° to +50°C (32° to 122°F)
2. Storage Temperature: 0° to +50°C (32° to 122°F)
3. Humidity: Maximum 0% to 90% relative

H. Model:
1. Samsung
2. ViewSonic
3. Or EQUAL

2.12 DUAL MONITOR WORKSTATION

A. Provide HP Z4 G4 management workstation with Intel's Xeon W-2123 (3.6 GHz, 8.25 MB cache, 2666 MHz memory speed, 4C CPU), 16 GB ECC Registered Memory and NVIDIA Quadro P2200 (5 GB) graphics card ensures highest performance and resolution for fast presentation of displayed video data in a convertible mini-tower chassis with 750w, 90% efficient, custom PSU.

B. Microsoft Windows 10 Professional Edition, 64-bit OS

C. HP 512GB SATA SED Opal2 Solid State Drive.

D. 4 Passive Display Ports (DisplayPort to DVI adapters included)

E. Provide with HP 3–year Next Business Day on-site hardware warranty.

F. Model:
1. Bosch MHW-WZ4G4-HEN2
2. Dell
3. HP - Hewlett-Packard
4. Lenovo

2.13 QUAD MONITOR WORKSTATION

A. Provide HP Z4 G4 management workstation with Intel's Xeon W-2123 (3.6 GHz, 8.25 MB cache, 2666 MHz memory speed, 4C CPU), 16 GB ECC Registered Memory and NVIDIA RTX4000 (8 GB) graphics card ensures highest performance and resolution for fast presentation of displayed video data in a convertible mini-tower chassis with 750w, 90% efficient, custom PSU.

B. Microsoft Windows 10 Professional Edition, 64-bit OS

C. HP 512GB SATA SED Opal2 Solid State Drive.

D. 2 Passive Display Ports (DisplayPort to DVI adapters included)

E. Provide with HP 3–year Next Business Day on-site hardware warranty.

F. Model:
   1. Bosch MHW-WZ4G4-HEN4
   2. Dell
   3. HP - Hewlett-Packard
   4. Lenovo

2.14 SERVER

A. Provide as required for VMS and VRM.

B. HP ProLiant DL380 Generation 10 (G10) Server with hot plug fans and power supplies, and RAID controller with RAID-1 operating system protection. One (1) state-of-the-art eight-core Intel Xeon Silver 4110 Processor (2.1 GHz, 8 core, 85 W, and 16 (1 X 16 GB PC3L-10600R (DDR4-2666) Registered DIMMs. 1 x Four Port Gigabit Server Adapter.

C. Provide a 3–year standard warranty.

D. The server shall come in a 2U, 19-inch rack mount version with a quick deploy rail system, including sliding universal rails. The rack mount version allows access to all system components for easy in-rack serviceability.

E. Model:
   1. Bosch MHW-S380RA-SC
   2. Dell
   3. HP - Hewlett-Packard

2.15 ISCSI STORAGE DEVICES

A. General Characteristics:
   1. The IP Video Storage System shall be an embedded, all-in-one IP Video Storage subsystem that provides “plug-and-play” iSCSI-based recording and management, pre-configured and pre-installed iSCSI disk array, 2U or 3U rack-mount chassis with eight (8) or sixteen (16) hot swappable, SATA-3 hard disk drives with RAID-5/RAID-6 protection,
   2. The IP Video Storage System shall be a pre-configured and pre-installed video management solution with 32TB (8X4) 64TB (8X8), 96TB (8X12), 128TB (16X8) or 192TB (16X12) of gross storage capacity, and a bandwidth of 550 Mbit/s.
   3. The IP Video Storage System shall offer a dual port Gigabit Ethernet network interface, 8 GB system memory and an Intel Xeon Quad Core Processor, remote monitoring via a desktop application or a Web browser.

B. Processor

1. The IP Video Storage Appliance shall contain an Intel Xeon Processor E3-1275 V3 (8MB Cache; 3.5GHz) processor.
2. The IP Video Storage Appliance processor shall contain one (1) socket.
3. The IP Video Storage Appliance processor shall feature a 1 x 8 MB Level 2 cache memory.
4. The IP Video Storage Appliance processor shall include ECC Unbuffered memory protection.
5. The IP Video Storage Appliance processor shall contain a 1600 MHz maximum front side Bus.

C. Memory
1. The IP Video Storage Array shall have 8 GB, DDR3-1666 ECC UNB (1 x 8 GB) of memory installed.

D. Storage
1. The IP Video Storage Appliance shall contain eight (8) or sixteen (16) 3.5 in. SATA storage trays.
2. The IP Video Storage Appliance shall have 8 or 16, 3, 4 6 or 8 TB SATA-3 (7,200 RPM, 64 MB 3.5 in.) hard drives installed.
3. The IP Video Storage Appliance shall offer a 3108-based SAS3 RAID card.
4. The IP Video Storage Appliance shall include 2 X 120 GB SSD RAID-1 OS hard drives

E. Functions
1. The IP Video Storage Appliance shall feature a single-socket system, sever-class motherboard.
2. The IP Video Storage Appliance shall offer an energy-efficient hot-swap redundant power supply.
3. The IP Video Storage Appliance shall offer hot-swap SATA-3 hard drives providing up to 192 TB of gross storage capacity.
4. The IP Video Storage Appliance shall come pre-installed and pre-configured with all necessary software.
5. The IP Video Storage Appliance shall utilize Microsoft Windows Server 2016, 64-bit.

F. Management
1. The IP Video Storage Appliance shall come with Bosch VMS management application pre-configured and pre-licensed
2. The IP Video Storage Appliance shall allow operators to use one central tool for configuration and operations management.

G. Monitoring
1. The IP Video Storage Appliance shall provide SNMP, Remote Desktop and HTTP monitoring support.
2. The IP Video Storage Appliance shall offer high-availability hardware, embedded design, and system wide monitoring.

H. Electrical:
1. Input Voltage: 140 VAC
    a. Actual Output Wattage from Power Supply: 413.9 W
    b. Efficiency of Power Supply: 92%
    c. Total System Power Consumption: 449.9 W
    d. Total BTU/h: 1535.4
    e. Power Factor: .98
    f. System AC Input VA Requirement: 459 VA

I. Mechanical
   1. Form Factor: 2U or 3U Rack Mount
   2. Power Supply: 1200 W Platinum Level redundant
   3. USB Ports: 4 USB 2.0; 2 in rear, 2 in front, 2 USB 3.0 ports rear
   4. Network: Dual Intel® i210AT Gigabit LAN (teamed), 1 IPMI BMC port
   5. Dimensions (H x W x D): 648 x 437 x 89 mm (25.5 x 17.2 x 3.5 in (2RU) or 5.2 in(3RU).)
   6. Weight: 23.6 kg (52 lb) 2RU or 32.7 kg (72 lb) 3RU

J. Environmental:
   1. Operating Temperature: +10°C to +35°C (+50°F to +95°F)
   2. Operating Relative Humidity: 8 to 90%, non-condensing

K. Model:
   1. Bosch Divar IP 7200 series with accessories and licenses as required
   2. OR EQUAL

2.16 VIDEO MANAGEMENT SYSTEM

A. The video management system (VMS) specified is an enterprise-class client/server based IP video security solution that provides seamless management of digital video, audio and data across an IP network. The video management system is designed to work with Bosch CCTV and ONVIF compliant 3rd party products as part of a total video security management system to provide full virtual matrix switching and control capability. The video management system consists of the following software modules: management server, recording services, configuration client and operator clients. Video from other sites may be viewed from single or numerous workstations simultaneously at any time. Cameras, recorders, and viewing stations may be placed anywhere in the IP network.

B. The VMS shall support the following recording services:
   1. Bosch Video Recording Manager (Bosch VMS VRM)
   2. Local Storage and Direct-to-iSCSI recording
   3. Bosch Streaming Gateway
   4. Bosch DVRs

C. The management server and the Bosch Video Recording Manager shall run as services on Windows Server 2012R2, Windows Server 2016, or Windows Server 2019.

D. The configuration client software shall run as an application on Windows Server 2012R2,Windoiws Server 2016, Windows Server 2019 or Windows 10.

E. The operator client software shall run as an application on Windows 10.

F. The VMS shall support ONVIF compliant cameras. It shall be possible to access live streams and to control PTZ functionality.

G. It shall be possible to record Onvif compliant cameras. For recording only, 3rd party cameras that support JPEG or RTSP shall be supported.

H. The VMS shall provide a transcoding service for supporting iPad and iPhone devices as well as html5 based web clients as mobile video clients.

I. Mobile video clients shall be able to access live and recording data of all cameras in the video management system. It shall be possible to view up to 4 video streams at once on a web client or iPad and mix live and playback streams. The mobile video clients shall further more provide an option for the user to zoom in as well as to opt between high resolution and smooth motion (higher rate of frames per second). It shall be possible to access the video management system from mobile video clients with the user accounts in the video management system.

J. The VMS shall be scalable to an Enterprise Management System that allows a user of an operator client to simultaneously access the devices of multiple subsystems. Each subsystems shall contain 1 management server. The Enterprise Management Server shall manage up to 10 subsystems. If each subsystem is restricted to 100 cameras, the number of subsystems may be extended to 30 Subsystems. Access permissions of Enterprise Operator Clients to subsystems and their devices shall be managed within the subsystems by means of a user ID and PW. Enterprise Operator Clients can than only access subsystems, when respective user ID and PW and set correctly in their Enterprise User group. An Enterprise Management Server shall be able to provide 20 Enterprise Management User groups. A change in a subsystem's configuration shall be automatically reflected for the Enterprise Operator Client. Extensions in the subsystems shall not require any additional licensing within the dedicated Enterprise Management Server.

K. The VMS shall provide a documented Software Development Kit (SDK) to allow integration to and integration from third-party software.

L. The VMS specified shall be a centrally managed, scalable client/server based architecture that allows full virtual matrix switching and control systems.

M. The VMS shall be capable to be deployed in Local Area Networks (LAN) as well as in Wide Area Networks (WAN). For establishing remote connections across WAN, it shall be possible to setup a port mapping table within the configuration manager in order to map the public port to a private IP and port of the devices. The VMS shall provide a RRAS configuration tool to transfer the port mapping table to a RRAS Service.

N. The VMS shall allow a operator client to control and view live and playback streams of cameras allocated to the VRM, VSG and DVRs from a remote site (across WAN). This includes ONVIF cameras connected to the VSG.

O. The VMS shall provide the possibility to the operator to view transcoded video streams (live and playback) in order view high quality images, when the remote operator client accesses the camera via a low bandwidth connection. On selection, there shall be an indication in the image pane of the operator client to indicate, that the stream is being transcoded.

P. The VMS shall provide a built-in command script editor that allows customized command scripts to be written to control virtually all the system functions. Command scripts may be activated by system operators or automatically in response to alarms or system events. The built-in command script editor shall support C# and VB.NET.

Q. The VMS shall emulate the Allegiant Command Console Language (CCL). The VMS shall receive the CCL commands on a freely definable serial port on the management server. It shall be possible to select the Allegiant model that shall be emulated. CCL commands shall control:
   1. Camera to decoder connections
   2. Sequences on decoders
   3. Virtual Inputs
   4. PTZ commands

R. The VMS shall support all Bosch Security Systems MPEG-4, H.264 and H.265 encoders, decoders, IP cameras, IP AutoDomes, Allegiant matrix switches.

S. The VMS shall provide up to 10 different and independent programmable recording schedules. The schedules may be programmed to provide different record frames rates for day, night, and weekend periods as well as special days. Advanced task schedules may also be programmed that could specify allowed logon times for user groups, when events may trigger alarms, and when data backups should occur.

T. The VMS shall allow the establishment of user groups and Enterprise user groups that have access rights to specific cameras, priority for pan/tilt/zoom control, rights for exporting video, and access rights to system event log files. Access to live, playback, audio, PTZ control, preset control, and auxiliary commands shall be programmable on an individual camera basis.

U. The VMS shall interface with the Intelligent Video Analysis (IVA) techniques of the Bosch IP encoders and IP cameras to provide advanced motion detection that analyzes object size, direction, and speed as well as detecting objects entering or leaving designated areas.

V. The VMS shall support Lightweight Directory Access Protocol (LDAP) that allows integration with enterprise user management systems such as Microsoft Active Directory.

W. The VMS shall export video and audio data optionally in ASF format to a CD/DVD drive, a network drive, or a USB drive. The exported data in ASF format may be played back using standard software such as Windows Media Player. It shall also export video and audio data optionally in its native recording format to a CD/DVD drive, a network drive, or a direct attached drive. The exported data in native recording format shall include all associated metadata. Viewer software shall be included with the export. Once installed, the viewer software allows playback of the streams on any compatible Windows PC.

X. The VMS shall auto-discover encoder, decoder, VRM devices and DVRs. Device detection shall support devices in different subnets.

Y. The VMS shall support continuous operation during management server down-times as live viewing, playback of recording and export of video data. The operator client shall indicate its connection status to the management server.

Z. The VMS software shall be maintenance free and provide free software upgrades, patches and firmware. Software with annual maintenance agreements shall not be allowed

AA. Model (the latest version of):
1. Avigilon
2. Bosch Video Management Software MBV-BPRO-10.1 or equal software with expansion licenses as required by project.
3. Milestone
4. OnSSi
5. VideoXpert (Pelco)

2.17 VIDEO RECORDING MANAGER (VRM)

A. The VRM shall be an optional package of the installation program of the VMS.

B. The video management system shall be capable of managing multiple VRMs.

C. The VRM shall be configured from the VMS configuration client. It shall be possible to assign encoders and IP cameras to it.

D. The recording parameters shall be configured in the recording tables of the VMS configuration program. These settings will be replicated into the devices from the management server.

E. The VRM shall manage exclusively the Bosch encoders, Bosch IP-Cameras, Bosch Streaming Gateways, and the Bosch supported iSCSI storage systems. It shall offer system wide recording monitoring and management of iSCSI storage, video servers and cameras.

F. The VRM shall support the encoders and cameras to directly stream the data to the iSCSI storage. The VRM shall not be involved in the processing of the data.

G. The VRM shall manage all disk arrays in the system as a single virtual common pool of storage. It shall dynamically assign portions of that pool to the encoders and IP-Cameras.

H. The transfer rate of the data from the encoder or IP-Camera is limited by network speed and the iSCSI data throughput rate.

I. The VRM shall provide redundancy for storage provisioning and failover design for central recording management service.

J. The VRM shall be able to restore a lost recording database from data on the iSCSI storages.

K. The VRM shall provide flexible retrieval of recordings. It shall be able to determine on which iSCSI disk array data from each camera or encoder has been stored.

L. It shall be possible to secure the access to the VRM software with a password. This shall be done in the configuration client.

M. The VRM software shall provide status monitoring information as a web interface. The following information shall be provided:
   1. Uptime of the VRM software
   2. Bit rate information for the recorded data
   3. Retention times per camera
   4. Status on recording and storage

N. The video management system shall allow configuring if playback of recordings is streamed through the VRM or is streamed directly from the iSCSI storage.

O. The video management system shall support to retrieve the playback information, i.e. from which iSCSI storages to retrieve the video, audio and meta-data, either from the Video Recording Manager or directly from the IP encoder or camera. Playback information directly from the IP encoder or camera is limited in time and should be used while the VRM is not available to increase the reliability of the video management system.

P. Model:
   1. Bosch Video Recording Manager (VRM) 3.83
   2. Or Equal

2.18 EDGE ETHERNET SWITCH

A. The switch shall support transmission utilizing Category 5 cable or better, multimode fiber, or single-mode fiber. The switch shall support IEEE 802.3 protocol using Auto-negotiating and Auto-MDI/MDI-X features. The switch shall be capable of supporting IEEE 802.3at 30 Watt PoE at each of the 24 (twenty-four) RJ-45 ports, considering the 400 W PoE budget for the switch as a whole. The switch shall have a fully internal power supply. The switch shall feature 22 (twenty-two) dedicated 10/100/1000T(X) RJ-45 ports capable of 802.3at PoE, 2 (two) dedicated 100/1000FX SFP ports, and 2 (two) combo ports, each combo port containing 1 (one) 10/100/1000T(X) RJ-45 port capable of 802.3at PoE and 1 (one) 100/1000FX SFP port

B. To ease installation, the switch shall require no in-field electrical or optical adjustments or in-line attenuators. The switch shall provide power, link speed, and fiber port status indicating LED's for monitoring proper system operation. The switch shall provide a serial connection for local management of the device. The switch shall have a lifetime warranty to reduce system life cycle cost in an event of a failure.

C. The following IEEE Networking Standards shall be supported:
   1. IEEE 802.3 10Base-T Ethernet
   2. IEEE 802.3u 100Base-TX Fast Ethernet
   3. IEEE 802.3ab 1000Base-TX Gigabit Ethernet
   4. IEEE 802.3at Power over Ethernet
   5. IEEE 802.3z Gigabit Ethernet Fiber
   6. IEEE 802.3x Flow Control and Back-pressure
   7. IEEE 802.1p class of service
   8. IEEE 802.1Q VLAN and GVRP
   9. IEEE 802.1D-2004 Rapid Spanning Tree Protocol (RSTP)
   10. IEEE 802.1s Multiple Spanning Tree Protocol
   11. IEEE802.3ad LACP
   12. IEEE802.1X Port-based Network Access Control
   13. IEEE 802.1AB LLDP

D. Switching Performance
   1. Switch Technology: Store and Forward Technology with 52 Gbps Switch Fabric.
   2. Transfer Packet Size: 64 bytes to 9600 bytes (with VLAN Tag)
   3. MAC Address: 8K MAC
   4. Packet Buffer: 1Mbits
   5. Relay Alarm: Dry Relay output with 1A@24V ability

E. Management
   1. Configuration: Web, HTTPS, SSH, TFTP/Web Update for firmware and configuration backup/restore, DHCP Client, Warm reboot, Reset to default, Admin password, Port Speed/Duplex control, status, statistic, MAC address table display, Static MAC, Aging time, SNMP v1, v2c, v3, Traps and RMON1.
   2. SNMP MIB: MIB-II, Bridge MIB, VLAN MIB, SNMP MIB, RMON and Private MIB
   3. Port Trunk: Up to 5 Static Trunk and 802.3ad LACP
   4. VLAN: IEEE802.1Q VLAN, GVRP. Up to 64 VLAN groups
   5. Quality of Service: Four priority queues per port,
   6. IEEE802.1p COS and Layer 3 TOS/DiffServ
   7. IGMP Snooping: IGMP Snooping V2/V3 for multicast filtering and IGMP Query
   8. Rate Control: Ingress filtering for Broadcast, Multicast, Unknown DA or all packets, and Egress filtering for all packets

9. NTP: Network Time Protocol to synchronize time from Internet
10. PTP: Precision Time Protocol for clock synchronization.
11. Port Mirroring: Online traffic monitoring on multiple selected ports
12. Port Security: Assign authorized MAC to specific port
13. IP Security: IP security to prevent unauthorized access
14. 802.1x: Port-based Network Access Control
15. DHCP Server: Can assign 255 IP address, support IP and MAC binding
16. System Log: Supports both Local mode and Server mode

F. Network Redundancy
1. Rapid Spanning Tree Protocol: IEEE802.1D-2004 Rapid Spanning Tree Protocol.
2. Compatible with Legacy STP and IEEE802.1w.
3. Multiple Spanning Tree Protocol: IEEE 802.1s

G. Data Specifications
1. Data Interface: Ethernet IEEE 802.3
2. Data Rate: up to 1000 Mbps
3. Data Inputs/Outputs: up to 26
4. Operation Mode: Half or Full Duplex

H. Specification
1. Number of Optical ports: up to 4 SFP-based
2. Number of Fibers Required: 1 or 2, SFP-dependent
3. Optical Wavelength: 1310 or 1550 nm, SFP-dependent
4. Optical Power Budget: SFP-dependent
5. Maximum Distance: up to 120 km (70 mi) singlemode, SFP-dependent

I. Status Indicators
1. Power: Proper Power = Green
2. RJ-45 Link/Data: Green, No Link/No Data: Off
3. SFP Link/Data: Green, No Link/No Data: Off

J. Connectors
1. Optical: LC or SC, SFP-dependent
2. Power: IEC60320 connector for standard AC line cord.
3. Data: RJ-45
4. Console: DB9 serial communication.

K. Electrical Specifications
1. Power: Internal power supply, 100 to 240 VAC, 50-60 Hz input.
2. PoE Support: 400 watts available for 24 ports with PoE+ (30W available at all 24 ports, not to exceed 400 W total PoE consumption), at a maximum ambient operating temperature of +60˚ C.
3. Current Protection: Automatic re-settable solid-state current limiters
4. Voltage Regulation: Solid-state, Independent on each board
5. Circuit Board: UL 94 flame rated and meets all IPC standards.

L. Mechanical Specifications
1. 17.5 in (W) x 13.8 in (D) x 1.73 in (H)
2. Finish: Module shall be constructed of a metal enclosure with a powder coat.

M. Environmental Specifications
1. MTBF: >100,000 Hours

2. Operating Temp: –5˚ C to +45˚ C.
3. Storage Temp: -40˚ C to +70˚ C.
4. Relative Humidity: 5% to 90% (non-condensing).

N. REGULATORY AGENCIES/APPROVALS AND LISTINGS
1. Underwriters Laboratory (UL) Listing Number: I.T.E. 6D16
2. Underwriters Laboratory Canada (ULC) Listing Number: I.T.E. 6D16
3. UL 94-flame rated PCB board: 94VO

O. Models:
1. Cisco Catalyst 9200 Series PoE

2.19 CORE ETHERNET SWITCH (NOT REQUIRED)

A. The core Ethernet switch shall be enterprise-class stackable Ethernet and Multigigabit Ethernet access and aggregation layer switches that provide full convergence between wired and wireless on a single platform. The core Ethernet switch shall support full IEEE 802.3at Power over Ethernet Plus (PoE+), modular and field-replaceable network modules, RJ45 and fiber-based downlink interfaces, and redundant fans and power supplies. With speeds that reach 10Gbps, the core Ethernet switch shall support current and next-generation wireless speeds and standards (including 802.11ac Wave 2) on existing cabling infrastructure. The switch shall support transmission utilizing Category 5 cable or better, multimode fiber, or single-mode fiber.

B. The core Ethernet switch shall be provided with following capabilities:

1. Integrated wireless controller capability with:
   a. Up to 40G of wireless capacity per switch (48-port models)

   b. Support for up to 50 access points and 2000 wireless clients on each switching entity (switch or stack)

2. 24 and 48 10/100/1000 data PoE+ models with energy-efficient Ethernet (EEE)
3. 24 and 48 100Mbps/1/2.5/5/10 Gbps UPOE models with energy-efficient Ethernet (EEE)1
4. 12- and 24-port SFP-based models
5. Five optional uplink modules with 4 x Gigabit Ethernet, 2 x 10 Gigabit Ethernet, 4 x 10 Gigabit Ethernet, 8 x 10 Gigabit Ethernet$_2$ or 2 x 40 Gigabit QSFP$_2$ ports
6. Dual redundant, modular power supplies and three modular fans providing redundancy
7. Full IEEE 802.3at (PoE+) with 30W power on all copper ports in 1 rack unit (RU) form factor
8. Software support for IPv4 and IPv6 routing, multicast routing, modular quality of service (QoS), Flexible NetFlow (FNF), and enhanced security features
9. The core Ethernet switch shall be provided with advanced wired plus wireless QoS capabilities. The switch shall manage wireless bandwidth using unprecedented hierarchical bandwidth management starting at the per-access-point level and drilling further down to per-radio, per-service set identification (SSID), and per-user levels. The switch shall be capable of automatically allocating equal bandwidth among the connected users within a given SSID. This makes sure that all users within a given SSID get a fair share of the available bandwidth while being connected to the network. The UADP ASIC enables the hierarchical bandwidth management and fair sharing of bandwidth, thereby providing hardware-based QoS for optimized performance at line-rate traffic.

10. The core Ethernet switch shall be provided with security features such as IEEE 802.1x, port security, Dynamic Host Configuration Protocol (DHCP) Snooping and Guard, Dynamic ARP Inspection, RA Guard, IP Source Guard, control plane protection (CoPP), wireless intrusion prevention systems (WIPSs), and so on enable protection against unauthorized users and attackers. With a variety of wired plus wireless users connecting to the network, the switch shall supports session-aware networking, in which each device connected to the network is identified as one session, and unique access control lists (ACLs) and/or QoS policies can be defined and applied using the ISE for each of these sessions, providing better control on the devices connecting to the network.

C. The core Ethernet switches performance capabilities:
   1. Switch capacity:
      a. 176Gps on 48 port model
      b. 92 Gbps on 24-port models
      c. 68 Gbps on 12-port model
   2. Stacking bandwidth: 480Gps
   3. Total number of MAC addresses: 32,000
   4. Total number of IPv4 routes: 24,000
   5. FNF entries:
      a. 48,000 flow on 48-port models
      b. 24,000 flows on 12-port and 24-port models
   6. DRAM: 4 Gb
   7. Flash: 2 Gb
   8. Vlan ID(s): 4,000
   9. Jumbo Frame: 9198 bytes
   10. Total Routed ports per 3850 Stack: 2018

D. The core Ethernet switches physical characteristics:
   1. Dimensions: 1.75” X 17.5” X 17.7”
   2. Weight: 15.5 lb
   3. Environmental: -5C to 45C
   4. Relative Humidity: 10% to 95%, noncondensing
   5. Connectors and Cabling:
      a. 1000BASE-T ports: RJ-45 connectors, 4-pair Car5E UTP cabling
      b. 1000BASE-T SFP based ports: RJ-45 connectors, 4-pair Car5E UTP cabling
      c. 100BASE-FX, 1000BASE-SX, -LX/LH, -ZX, -BX10, DWDM and CWDM SFP transceivers: LC fiber connectors (single mode and multimode fiber)
      d. 10GBASE-SR, LR, LRM, ER, ZR, DWDM SFP+transceivers: LC fiber connectors (single mode and multimode fiber)
      e. CX1 cable assemblies: SFP+Connectors
      f. Ethernet Management Port: RJ-45 connectors, 4-pair Car5E UTP cabling
      g. Management Console Port: RJ-45 to DB9 cable for PC connection

E. The core Ethernet switches Power characteristics:
   a. Power Supply Rated Maximum: 1100W/715W/350W/440W
   b. Total BTU Output: 3793 BTU/hr; 2465 BTU/hr; 1207 BTU/hr
   c. Input Voltage Range: 115-240VAC
   d. Input Current Range: 12-6A

F. Model:
   1. Cisco Catalyst 9500 Fixed Core/Aggregation Series

2.20 VIDEO WIRING SYSTEMS

A. Provide multimode fiber optic cabling and patching for all backbone and non-backbone fiber optic media conversion.
   1. New fiber optic cabling paths for long camera runs requiring media converters shall use OM3/4 Indoor/Outdoor Fiber, 900 micron tight buffer:
      a. Panduit
      b. Or Equal
   c. New fiber optic patch cables from the switches to the existing fiber optic network backbone shall be OM1 62.5/125 micron.
      a. Panduit
      b. Or Equal

B. Data Cable: Unshielded 4-pair, shall exceed all requirements for ANSI/EIA/TIA-568-A-5 and support high speed communication network applications. See 28 05 10 for further requirements.
   1. Category 6 minimum:
      a. Panduit
         1. Provide riser or plenum jacket rating as applicable per installation environment. Coordinate jacket color with the County's IT department
         2. Patch cables shall use green keystone jacks and green patch cables for video.
         3. Panduit UTPSP4GRY (4 foot) or Equal
         4. Panduit UTPSP7GRY (7 foot) or Equal

C. CAT6 patch panels and management :
   1. Flat 48 port patch panel and keystone jacks
      a. Panduit CPPL48WBLY
      b. Panduit CJ688TGGRY
      c. Or Equal
   2. 2RU horizontal cable manager
      a. Panduit NCMHF2
      b. Or Equal

D. See 28 0510 Common Work Results for general cabling requirements.

2.2 MEDIA CONVERTERS

A. Transmits and receives 1000 Mbps data over multimode, single mode, optical fiber, or 10/100/1000 Mbps data over CAT5e or Cat6 electrical cable. The media converter shall meet following requirements:
   1. Data Interface: Ethernet
   2. Data Rate: 10/100/1000 Mbps, IEEE 802.3 Compliant
   3. Operating Mode: Full Duplex or Half Duplex
   4. MTBF: > 100,000 hours
   5. Operating Temp: -40° C to +74° C
   6. Storage Temp: -40° C to +85° C
   7. Relative Humidity: 0% to 95%
   8. Model:
      a. Axis
      b. Or Equal

2.3 PTZ CAMERA POWER SUPPLIES

A. Provide minimum 60W PoE+ injector where recommended by the camera manufacturer. Provide adequate mounting hardware in rack to accommodate the number of PoE injectors required.
   1. Axis T8134 or later model
   2. Or Equal

2.21 CAMERA SCHEDULE (SEE ES604 DRAWINGS)

A. Schedule shall be reviewed and modified as needed during submittal phase to accommodate all alarming inputs prior to system programming.

2.22 SPARE PARTS

A. Provide spare parts as follows:
   1. Camera: Two (2) of each type required.
   2. Network Switches: Each provided network switch shall have 20% spare ports
   3. LCD HD Monitors 27”: One (1)

PART 3 - EXECUTION

3.1 INSTALLATION (SEE SECTION 280510)

A. Install all equipment in accordance with manufacturer’s recommendations.

B. Provide rack mount equipment as required for all equipment shown rack mounted on the drawings.

C. Install all video surveillance system cabling in conduit.

D. Provide conduit with pull strings, boxes, and video system capacity for future cameras indicated on plans.

E. Make all connections to video equipment with approved connectors for cable used.

F. After Substantial Completion and initial programming as specified, provide a minimum of eight (8) hours of time with Owner Representative for review of specified program and modification to User's requirements.

3.2 TESTING (SEE SECTION 280510)

A. Testing Specifications for each fiber optic cable:
   1. All of the following test shall be performed on each fiber in each cable installed and each test results shall be provided in written form
   2. End to end attenuation test with power meter. Maximum attenuation on installed cables / fibers shall be within the manufacturer's specifications.

B. The testing of both windows of each fiber optic cable.
   1. If splicing of a fiber optic cable is required due to site conditions, each fiber in the associated cable shall be tested using an Optical Time Division Reflectometer (OTDR). All testing information and locations of each splice shall be in written form and provided with the as-build documents. The following items must be tested on each fiber associated with a splice.
      a. Test each strand on one wavelength in one direction on each segment, no jumper allowed, and document.
      b. Test for overall continuity and document.
      c. Verify the length of each segment and document.
      d. Locate and indicate all splices on drawings.

3.3 WIRING (SEE SECTION 280510)

3.4 OWNER PERSONNEL TRAINING (SEE SECTION 280510)

A. Provide training of owner personnel in proper operation and maintenance of video surveillance system.

B. Training Outline-Operational staff
   1. Functions performed
   2. Control Functions
   3. Recording/Playback

C. Training Outline-Maintenance Staff
   1. Systems Operation
   2. Component Review
   3. Routine Maintenance/Adjustments
   4. Troubleshooting/Repair

END OF SECTION

SECTION 28 31 00 – FIRE DETECTION AND ALARM SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

A. This specification includes the furnishing, installation, connection, and testing of a PC based graphical facilities monitoring system; including Underwriters Laboratories (UL) listed application software and hardware complete and ready for operation.

B. The basic system shall be Underwriters Laboratories (UL) listed for the following:

1. No. 294 Access Control System Units, Fifth edition
2. No. 864 Control Units for Fire Protective Signaling Systems, Tenth edition
3. No. 1076 Proprietary Burglar Alarm Units and Systems, Fifth edition
4. No. 2017 General-Purpose Signaling Devices and Systems, First edition
5. No. 2572 Mass Notification, Fifth edition

C. The system shall comply with requirements of NFPA Standard No. 72 for Proprietary Signaling System Receiving Unit except as modified and supplemented by this specification.

D. The system and associated equipment as specified herein shall be manufactured 100% by a single U.S. manufacturer (or division thereof).

1. The manufacturer shall be of the highest caliber and quality.
2. An ISO 9001 certified company shall manufacture the system.

1.2 SCOPE

A. A PC based graphical facilities monitoring system shall be installed in accordance to the project specifications and drawings.

B. The PC based graphical facilities monitoring system shall include, but not be limited to, optional touch screen or LCD wide screen monitor, one or more PC based graphical workstations, all input/output devices, network communications media, control equipment, auxiliary control devices, power supplies, and wire / fiber optic media as shown on the drawings and specified herein.

C. A supervised interface to NOTIFIER fire alarm control panels and NOTI-FIRE-NET shall be made available.

D. The system shall employ an advanced technology network to monitor and control various fire, security and other facility information over a network.

E. The system shall include an interface to digital alarm communicator receivers for wide area network monitoring.

F. The system shall include a device that allows remote viewing of the ONYXWorks system via the Internet or an intranet.

G. The system shall include a redundant interface for NOTI-FIRE-NET network for survivability.

H. The system shall allow a mixture of different technologies and manufacturers' equipment to operate on the same network and provide the operator with a consistent look and operation for all monitored equipment.

I. The system shall support a variety of topologies and media and shall provide an industry standard open architecture transport layer protocol.

J. Using standard RS-232 ports on existing and future monitoring and control systems used by the facility, the system shall connect to and interpret status change data transmitted from the ports and provide graphic annunciation, control, history logging and reporting as specified herein.

K. The system shall be electrically supervised and monitor the integrity of all conductors.

L. The system shall provide E-Mail functions capability to send system information via an email server to an email account.

M. The system shall utilize Boolean logic for automatic event response. The system shall have the facility to page directly from the workstation to any DVC installed on the network.

1.3 SUBMITTALS

A. General

1. Ten copies of all submittals shall be submitted to the architect, engineer, and owner for review.

2. All references to manufacturer's model numbers and other pertinent information herein are intended to establish minimum standards of performance, function and quality.

3. Equivalent compatible equipment (UL listed) from other manufacturers may be considered as a substitution for the specified equipment as long as the minimum standards are met.

4. Substitute equipment proposed as equal to the equipment specified herein shall meet or exceed the minimum specified standard. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Shop Drawings

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

2. Wiring diagrams shall indicate all wiring for each item of equipment and the interconnections between the items of equipment.

3. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

C. Manuals

1. Submit simultaneously with the shop drawings & submittals, complete operating manuals and technical data sheets.

2. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

3. Approvals shall be based on complete submissions of manuals together with shop drawings.

4. Provide a list of monitoring systems by model number including Fire Alarm, Security, CCTV, and Access Control systems currently UL listed to standard to operate with the proposed Facilities Monitoring System.

D. Certifications

1. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer and factory trained on all equipment contained in the submittal. Include names and addresses in the certification.

2. Provide NICET Certification documentation for factory authorized field technicians performing field final connections and system programming.

E. Applicable Publications

1. The publications listed below form a part of this specification. The publications are referenced in text by the basic designation only.

2. NFPA No. 70 – National Electric Code (NEC).

3. NFPA No. 72-2002 – National Fire Alarm Code.

4. UL No. 50 – Cabinets and Boxes.

5. UL No. 294 – Access Control System Units.

6. UL No. 864 – Control Units for Fire Protective Signaling Systems.

7. UL No. 1076 – Proprietary Burglar Alarm Units and Systems.
8. UL No. 1481 – Power Supplies for Fire Protective Signaling Systems.
9. Local and State Building Codes.
10. All requirements of the Authority Having Jurisdiction (AHJ).

F. Approvals. The system shall have the following listings:

1. UL No. 864 Control Units for Fire Protective Signaling Systems, Tenth edition
2. UL No. 1076 Proprietary Burglar Alarm Units and Systems, Fifth edition
3. UL No. 294 Access Control System Units, Fifth edition
4. UL No. 2572 Mass Notification, Fifth edition
5. ULC Control Units for Fire Alarm Systems
6. California State Fire Marshal (CSFM)

1.4 GUARANTY

A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor, and materials required to correct any defect during this one-year period shall be included in the submittal bid.

1.5 WORKSTATION PERFORMANCE

A. The network will interface and report the individually monitored system's status via a user-friendly Graphical User Interface (GUI) based software workstation.

B. The software shall operate under Microsoft® Windows® 10 64 bit OS as manufactured by Microsoft Corporation.

C. The GUI based software must be capable of graphically representing each facility being monitored with floor plans and icons depicting the actual locations of the various systems; and / or sensors' locations as well as view the system events in text mode.

D. The software shall use a 1920 pixels X 1080 pixels GUI display capable of showing a large primary floor plan display, a key map representative of a larger view of the primary display and its relationship to the facility being monitored, the current operator, number of fire, supervisory, pre-alarms, troubles, and security events within the network as well as outstanding events and acknowledged events.

E. The software shall have the capacity of at least 1,000 screens / floor plans or as dictated by hard drive space and installed VIDEO and RAM memory for efficient operation.

F. The software shall have the ability to float and dock windows to support dual monitors display.

G. The workstation shall have the ability to support graphic printing of all data including graphical floor plans, system activity, history, and guidance text. A Windows® compatible printer shall be supported for the graphics and report printer options.

H. The workstation software shall permit automatic navigation to the screen containing an icon that represents the system or sensor in the event of an off-normal condition.

I. The system/sensor icon shall indicate the type of off-normal condition, flash, and change to the color associated with the off-normal condition (e.g., RED for ALARM and YELLOW for TROUBLE).

J. The software shall allow the attachment of text (TXT) files, sound (WAV) files, image (BMP) files, and video (AVI) files to each system or sensor icon allowing additional information to be provided to the system operator for responding to the off-normal condition. The software must have the ability for an attachment for each major event type per device.

K. The software shall allow the importation of externally developed floor plans in Drawing Exchange Format (DXF), Windows Metafile (WMF), JPEG (JPG), Graphics Interchange Format (GIF) and Bitmap (BMP) format.

L. The software shall provide automatic navigation to the screen containing the icon of any system or sensor when an event is initially annunciated. In addition, operator navigation to screens containing outstanding events shall be accomplished by “clicking on” the event from either the acknowledged or unacknowledged event.

M. History Manager. The software shall contain a History Manager, which shall record all system events with a time and date stamp as well as the current system operator’s name.

1. The system shall provide the ability to store all off-normal events experienced by the various sub-systems that are monitored by the system.

2. All events shall be recorded with a time and date stamp and the system operator shall be provided with the ability to log a pre-defined response or a custom comment for each off-normal event and have that comment stored in the history file with the time, date, and operator name.

3. Provide the ability to conduct searches and generate subsequent reports, based on all events for a single system / device address, a specific node, a specific type of off-normal condition and date range (mm/dd/yy to mm/dd/yy) or combinations of these search parameters. The number of entries in the history file that match the determined search criteria will be displayed.

4. The History Manager shall automatically back-up the history file at 2,500,000 events.

5. It shall be possible to pre-select data fields for reporting and then saving the report as a template. It shall also be possible to schedule the pre-defined report to print at a designated time.

6. The History Manager shall provide the operator the ability to select the number of days or number of months to back-up history.

N. Alarm Monitoring. The system shall provide for continuous monitoring of all off-normal conditions regardless of the current activity displayed on the screen.

1. If an operator is viewing the history of a sub-system and an alarm condition should occur, the system shall automatically navigate to the graphic screen showing the area where the off-normal event is occurring.

2. The system shall prioritize all off-normal events as defined by National Fire Alarm Code® 72 into the following categories: fire alarms, troubles, supervisory alarms, pre-alarms and security alarms.

3. The system shall display a running count of all events by type in an alarm summary window. The alarm summary window shall include at least five counters, defaulted to Alarm, Pre-Alarm, Trouble, Security, and Supervisory events.

4. The system shall show a running list of all unacknowledged events and acknowledged events and allow the system operator to acknowledge an event by “double-clicking” on that event in the Unacknowledged Events box. The Unacknowledged and Acknowledged Events boxes shall contain an abbreviated description of the off-normal condition.

5. The details of the condition may be viewed by selecting event in the unacknowledged events box.

6. The system shall allow the attachment of user-definable text files, image files, video files, and sound files to each device / system monitored (for every event state) in order to facilitate the operators and response personnel’s response to the off-normal condition.

7. The system shall record all events to the system’s hard drive. A minimum of 2,500,000 events may be stored.

O. Reports & Logs:

1. The system shall provide for the ability to generate reports based on system history.

2. The system shall allow the system operator to enter custom comments up to 255 characters for each event and have those comments recorded in the system’s history file.

P. Boolean Logic

1. An automated event response application shall be provided to automatically perform actions across the entire system based on network activity.

2. The event response application shall allow event responses (actions) based on predefined user conditions using simplified Boolean logic.

3. Actions shall be configured to be executed immediately or timed as required.

Q. Control Aspects of System Software

1. The system shall have the ability to monitor and control the following NOTIFIER® Fire Alarm Panels using NOTI-FIRE-NET Network, or Embedded Gateway interfaces: AFP-1010, AM2020, AFP-200, AFP-300/400, and ONYX® series control panels.

2. The Gateway interfaces shall have the ability to be constructed in a redundant configuration with either two NFN Gateway computers monitoring the same nodes, or by having multiple Embedded Gateways on the same network, monitored by multiple workstation clients.

3. The system shall provide an NFN Gateway interface for direct connections to the Notifier Network containing the following panels: AFP-1010, AM2020, AFP-200, and the AFP-300/400 as well as ONYX® series control panels.

4. The system shall provide an Embedded Gateway interface for remote connections of the Notifier Network containing the following panels via Ethernet (TCP/IP infrastructure): AFP-1010, AM2020, AFP-200, and the AFP-300/400 as well as ONYX® series control panels.

5. The NFN Gateway and the Embedded Gateway will:

   - Serves as a bridge between an ONYXWorks® Workstation and a NFN network, and it uses that Workstation as the primary reporting station for the NFN network

   - Translates a NFN network's panel and device data into data that can be interpreted by the ONYXWorks® Workstation software application

   - Monitors NFN networks using ARCNET network architecture.

6 The workstation shall provide configuration utilities for monitoring and control profiles. These profiles shall be user definable for distribution of monitoring and control allowances for operators per workstation.

7. Under no condition shall any sub-system be required to rely on the network for any data processing required to perform its particular function. Each individual sub-system shall be in effect "stand-alone" as to ensure its continued operation should a disruption in communication with the system be experienced.

R. The software shall be password protected and provide for the definition of security profiles for operator access control.

S. The software shall contain provision for defining monitoring profiles of pre-selected Nodes for monitoring. This shall include provision for status types within the selected NODES.

T. The software shall support sending real-time off-normal event notifications to designated email addresses.

U. The software shall support live voice paging for mass notification to NOTIFIER voice evacuation system over Internet Protocol (IP).

V. The PC based graphical facilities monitoring system shall include a Configuration Tool that provides the following features:

1. Allows operators the ability to create and edit graphics
2. Set up Gateway Connections and define their nodes
3. Set system operating mode
4. Add and edit objects on screens
5. Configure colors and sounds for the status classes

PART 2 PRODUCTS

2.1 GENERAL

A. The product(s) shall be manufactured by as provided by NOTIFIER®. Model numbers specified are those of NOTIFIER® and are to establish the minimum standard of operating characteristics and quality.

B. Substitute equipment proposed as equal to the equipment specified herein shall meet or exceed the minimum specified standard. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

C. All equipment and components shall be new, and the manufacturer's current model. The materials, equipment, and devices shall be tested and listed by a nationally recognized approval agency.

2.2 WORKSTATION

A. The system shall be an ONYXWorks® Fire Systems Command Interface.

B. The system shall operate on no less than an IBM compatible UL listed Intel Quad Core processor operating at 2.4 GHz on the Microsoft® Windows® 10 64 bit OS platform.

C. The workstation shall be an industrial grade computer listed for UL Standards 864 (Control Units for Fire-Protective Signaling Systems) under category UUKL (Smoke Control Equipment). The workstation shall be capable of annunciation and control of all fire detection and smoke control points.

D. The workstation shall have: no less than 16 Gigabytes of RAM, Solid-State Hard Drive with no less than 240 Gigabytes of storage space, a minimum of 64 megabytes of video RAM, internal supervisory CPU watchdog board with audible annunciator, 100 Base-T Ethernet NIC card, a 104 key keyboard, and a mouse type pointing device with a center wheel.

E. The workstation shall come equipped with all necessary gateway modules to allow connection to the network(s) it monitors as standard equipment. All workstations shall support Ethernet communications when multiple workstations are required.

F. The workstation shall support dual SVGA monitors and be supplied with a 22” or 42” flat screen LCD monitor with integrated speakers or an optional touch screen monitor.

G. The computer shall be capable of networking to additional computers and these computers shall be capable of operating as workstations and/or gateways for local area or wide area networks.

H. Alarm annunciation shall appear on all workstations and may be silenced at each local workstation.

1. Only one workstation and operator shall be in command of the system for global alarm acknowledgement at any time.

2.3 PRINTER

A. Support one or more Windows® compatible printers to be located and connected each workstation for graphics and report printing.

B. Support one model PRN-7, 80-column dot matrix tractor feed industrial grade printer for event and date-stamped printouts of off-normal events and status changes per workstation.

2.4 NOTIFIER® MONITORING NETWORK

A. A The NOTIFIER® monitoring network shall consist of a network based on proven peer-to-peer technology and support standard NCM cards and High Speed NCM cards.

B. The network consisting of the standard NCM cards shall have the ability to use multi-mode fiber optic cable, wire (twisted pair copper media in a style 4 or style 7 configuration), or combination wire/fiber communications with support of up to 103 nodes with a data communications rate of 312,500 BPS.

1. Wire networks shall support 12 AWG, 1 Pair Shielded to 24 AWG, 4 Pair Unshielded following the manufacturer’s guidelines.

2. Fiber optic networks shall support 62.5/125µm cable (8dB limit) or 50/125µm cable (4.2dB limit),

3. Wire to fiber conversions cards.

C. The network consisting of the High Speed NCM cards shall have the ability to use fiber optic cable (both multi-mode and single-mode), wire (twisted pair copper media in a style 4 or style 7 configuration), or combination wire/fiber communications with support of up to 200 nodes with a data communications rate of 12MB (wire) or 100MB (fiber).

1. Wire networks shall support 12 AWG, 1 Pair Shielded to 24 AWG, 4 Pair Unshielded following the manufacturer's guidelines.

2. Fiber optic networks shall support 62.5/125µm cable (10dB limit), 50/125µm cable (6.5dB limit), or 9/125 µm cable (30dB limit).

3. Wire to fiber conversions cards.

2.5 INTEGRATION NETWORK

A. Digital Alarm Communicator Receiver Network

1. The system shall provide a digital alarm communicator receiver (DACR) gateway with a RS-232 interface to the following digital alarm communicator receivers for wide area event reporting: Ademco 685, Silent Knight 9500 and 9800, Radionics D6600, and Teldat Visor Alarm.
2. Each gateway shall support up to 10 digital alarm communicator receivers for alarm and trouble information from reporting devices.

B. Workstation Network:

1. Computers shall be networked using Ethernet supporting the use of TCP/IP protocol for local area systems.
2. The network shall be capable of supporting multiple clients (e.g., workstations, configuration applications, and automated response applications), NFN Gateway, High Speed NFN Gateway, and (200) Embedded Gateways.
3. A UL listed Ethernet Hub must be supplied for connection of multiple workstations, gateways, clients, and/or network printers.
4. System shall be UL listed to communicate between clients and gateways over a business computer network (shared IP).

PART 3 EXECUTION

3.1 GENERAL

A. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring & fiber optic diagrams, schematics, physical equipment sizes, etc., before beginning system installation. Refer to the riser/connection diagram for all specific system installation / termination / wiring data.

3.2 CONDUIT AND WIRE

A. Conduit shall be in accordance with the National Electrical Code (NEC), local and state requirements.

B. Where possible, all wiring & fiber optics shall be installed in conduit or raceway.

C. Cable must be separated from any open conductors of power, or class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760-55.

D. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

E. Conduit shall not enter the control equipment, or any other remotely mounted control panel equipment or back-boxes, except where conduit entry is specified by the FACP manufacturer.

F. All system wiring shall be new except as allowed herein and approved by the manufacturer for intended communications using NOTI-FIRE-NET or High Speed NOTI-FIRE-NET.

G. Wiring & fiber optics shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number

and size of conductors & fiber optics shall be as recommended by the fire alarm system manufacturer.

H. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system except as specified herein.

I. All communication wire to nodes or to computers shall consist of minimum manufacturer's recommendations and approved wire specification supporting speeds of 78Kps to 10mB/sec communications.

3.3 TERMINAL BOXES, JUNCTION BOXES, AND CABINETS

A. All boxes and cabinets shall be UL listed for their use and purpose.

B. The PC based workstations shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FACILITIES MONITORING SYSTEM. PC workstation power wiring shall be 12 AWG and grounded securely to either a cold water pipe or grounding rod. Where required, a UL 864 listed UPS system shall be provided.

3.4 SYSTEM SETUP & CONFIGURATION

A. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Field technicians shall be NICET Level 1 (minimum) certified.

B. The factory trained technician shall install initial data and artwork at each workstation including:

C. Distribution of monitoring, control and security profiles as requested by owner.

D. Area diagrams, floor plans, key maps and screen titles.

E. Auto-navigation criteria.

F. Guidance text as provided by owner.

3.5 FINAL INSPECTION

A. At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the system function properly in every respect.

3.6 INSTRUCTION/TRAINING

A. Provide instruction as required for operating the system. Hands on demonstrations of the operation of all system components and the entire system including user-level program changes and functions shall be provided. A factory trained and certified representative shall provide instruction.

END OF SECTION

SECTION 284619

ELECTRONIC SECURITY CONTROL SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. General:
1. Furnish all labor, materials, tools, equipment, and services for all electronic control systems as indicated in accordance with provisions of Contract Documents.
2. Completely coordinate with work of all other trades.
3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
4. See Division 01 for General Requirements.

B. Related work:

1.	Common Work Results for Electronic Security:	Section 280510
2.	Cabinets and Enclosures:	Section 280555
3.	Access Control System:	Section 281300
4.	Touch Screen Control and Management System:	Section 284623
5.	Uninterruptible Power Systems:	Section 285045
6.	Digital Intercom and Paging System:	Section 285123

1.2 BASIS OF DESIGN

A. The electronic security system described within the specifications and drawings shall function as an integrated system. The control and monitoring stations shall function as a single control point, appearing to function as a single system. Although the system is made up of several sub-systems, they shall be integrated in both physical and electronic manner to achieve a single system presentation to the operator.

B. The electronic control system is the central point of the integrated system. It performs all the logic and switching functions for the system as it communicates discreetly or through data interfaces to control stations, field devices (i.e. locks, intercoms, lights, power, phones), and related systems. The system is made up of a single Programmable Logic Controller (PLC) connected to a network (ECSN).

C. The touch screen control stations will generate commands to the ECS and receive status from the ECS. Communication between the touch screen control stations and the ECS shall be via the security network (ECSN).

D. Interface between Digital Video Management System and ECS shall be provided. Video images shall be displayed, and video recorded on the basis of selected alarms (i.e. intercom acknowledge, door alarms, duress alarms, etc.)

E. Control of devices such as detention area receptacles and lights shall be provided via control relays. These control relays shall in turn operate line voltage relays or contactors provided under the Division 26-Electrical work. Switching shall be controlled via the local TS station and the PLC. A means to provide feedback of status (on/off) must be provided.

F. The electronic control system is the central point of the integrated system. It performs all the logic and switching functions for the system as it communicates discreetly or through data interfaces to control stations, field devices (i.e. locks, lights, power), and related systems. The system is made up of several Programmable Logic Controllers (PLC) connected to a network (ECSN).
   1. The touch screen control stations will generate commands to the ECS and receive status from the ECS. Communication between the touch screen control stations and the ECS shall be via the security network (ECSN).
   2. Interface between Digital Video Management System and ECS shall be provided. Video images shall be displayed, and video recorded on the basis of selected alarms (i.e. intercom acknowledge, door alarms, motion detection, duress alarms, etc.)
   3. Control of devices such as detention area receptacles and lights shall be provided via control relays. These control relays shall in turn operate line voltage relays or contactors provided under the Division 26-Electrical work. Switching shall be controlled via the local TS station and the PLC.
   4. Miscellaneous devices (i.e. call buttons, duress buttons, etc.) shall be configured as inputs to the ECS with status displayed on the touch screen control stations.

1.3 QUALITY ASSURANCE (SEE SECTION 280510)

1.4 SUBMITTALS (SEE SECTION 280510)

A. Electronic Control System: Section 284619.
   1. Project data: Description of system operation indicating purpose and capabilities of each component of system with functional system diagram indicating all interfaces to other systems. Description shall include, and call attention to, all variances from the contract documents. Supply a sample of each maintenance report.
   2. Certification: Submit written certification that control wiring and locking control have been coordinated with security hardware. No submittal review will be conducted until receipt of certification. Certification letter shall read as follows:
      a. "(Manufacturer/Supplier name) has reviewed all electrical characteristics and control wiring requirements of all electric operated security devices, i.e., electric locks, position switches, door operators to be installed in this project and has incorporated all modifications and revisions required to provide a completely coordinated and functional control system."
   3. Shop drawings: Complete installation drawings including system diagrams and terminal point to terminal point wiring diagrams or schedules
   4. Product data: Technical data sheets and specifications for each component.
   5. Power supply distribution and load calculations.
   6. Testing: Test reports of fiber optic cable installation.

1.5 WARRANTY (SEE SECTION 28 0510)

1.6 OPERATING AND MAINTENANCE DATA (SEE SECTION 28 0510)

PART 2 - PRODUCTS

2.1 GENERAL

A. Acceptable manufacturers:
   1. ECSN Networking products (Managed Gigabit Series)
      a. Base: Hirschmann (Belden), Phoenix Contact, N-Tron (Red Lion)
   2. Programmable Logic Controller (PLC).
      a. Base: Omron NJ or NX Series, GE PACSystem RX3i, Schneider Electric/Modicon M340, Allen Bradley ControlLogix
   3. Switched Mode Power Supplies:
      a. Class 1: Omron, Allen Bradley, Power One, Emerson Sola, Phoenix Contact, IDEC
      b. Class 2: Omron, Allen Bradley, Power One, Emerson Sola, Phoenix Contact, IDEC
   4. Relays:
      a. Base: Omron, Allen Bradley, General Electric, Potter & Brumfield, Magnecraft, IDEC, Phoenix Contact, Finder
      b. Lock interposing relays must be rated for 10A minimum per pole and provide modular MOV insert and free-wheeling diode. 16A rated relays must be used for locks with 8A or more maximum current ratings.
   5. Other manufacturers desiring approval comply with Division 01.

B. Systems:
   1. Provide complete coordinated systems for operation, monitoring and control of systems as indicated on drawings and specifications.
   2. Include push-to-test function for lamp test on each panel. Provide circuitry as required for protection of all components.
   3. Provide all wire, cable, terminal blocks, and fittings.
   4. Provide terminal strips or connectorized plugs for connection of all incoming field wiring.
   5. All low voltage wiring in consoles shall be Class 1 or Class 2 power limited circuitry in strict accordance with NEC Article 725 except power cords for amplifiers, monitors, etc. Maintain separation of conductors as required.
   6. Provide wire restraint and bundling to prevent strain on devices.
   7. Terminate all wiring on terminal blocks for connection to field wiring. Label all terminal strips to coordinate with installation drawings.
   8. Wiring system shall be Class 1 for both control and indication. Maintain separation of conductors per NEC Article 725.
   9. Wiring and diagrams shown on drawings are provided for logic description only. Verify and install all wiring from approved shop drawings and installation drawings from manufacturers.
   10. The interaction time between system input at the control station and the activation of a field device shall not exceed 0.5 second. Similarly, the interaction time between field input device and display on the control station shall not exceed 0.5 second. For group operations such as emergency release and group unlock, the interaction time between system input at the control station and the activation of the last field device of a group shall not exceed ten (10) seconds.

2.2 ELECTRONIC CONTROL SYSTEM NETWORK (ECSN)

A. The Electronic Control System Network (ECSN) shall be made up of duplex PLC and CPUs of other systems in a distributed processing system. The PLC shall be connected to the ECSN for interface to Touch Screen stations (TS), Administration Station (ADS), File Server (FS) and other related integrated system CPUs.

B. The ECSN shall be a high speed, fault tolerant, Ethernet industrial data communications system. The interaction time between system input at the control station and the activation of a field device shall not exceed 0.5 second. Similarly, the interaction time between field input device and display on the control station or interface shall not exceed 0.5 second. For group operations such as emergency release and group unlock, the interaction time between system input at control location and the activation of the last field device of a group shall not exceed ten (10) seconds.

C. The ECSN shall be Ethernet based network in compliance with IEEE 802.3. Connections to PLCs and touch screen stations shall be Category 6 copper cable.
   1. Network Switches shall be of heavy-duty design with fault tolerance by means of redundant power supplies. Switches shall consist of 1000 Mbps backplane with multiple 100BaseT ports for connection to PLCs and 1000 Mbps port for connection to other integrated system CPUs. LED indicators shall be provided for each port to include power, data, collision, link status. Contacts for remote alarm reporting shall be provided for such fault messages. Contacts for remote alarm reporting shall be displayed as a system alarm on the touch screen control and management system.
   2. Network Switches:
      a. Network switches shall be modular and allow the use of fiber, copper or hybrid modules containing Ethernet ports.
      b. Network switches shall be expandable to 24 interface ports to meet network requirements.
      c. All network switches interfaces shall be capable of automatic detection of 1000 Mbps data transmission rates.
      d. Network switches shall be configurable via web-based management, SNMP or Telnet or locally.
      e. Model:
         1) Hirschmann RS40 or MICE Series (Belden brand)
         2) Phoenix Contact MMS
         3) Redlion N-Tron NT24k, 7000, 7900 series
         4) Cisco IE Series
   3. The ECSN shall include connections to each PLC, TS, ADS/FS, and other integrated system CPUs.
   4. Connect to indicator contacts (NC) on each network switch for remote trouble annunciation to Touch Screen Control and Management System

2.3 PROGRAMMABLE LOGIC CONTROLLER (PLC)

A. The Programmable Logic Controller shall be general purpose in nature and not custom designed for specific application. The PLC shall become location and operation specific upon installation of input/output modules and programming. The PLC shall be a standard product of a single manufacturer engaged in production of PLC's for industrial applications for a minimum of ten (10) years.

B. Environmental ratings for all components of the PLC system, except programming equipment, shall meet or exceed the following requirements:
   1. Ambient Temperature rating of 32 to 140 F operational and -4 to 158 F storage.
   2. Humidity rating of 10% to 90% Relative Humidity (non-condensing).
   3. All system modules shall be designed so as to provide for free airflow convection cooling. No internal fans or other means of cooling except heat sinks shall be required

C. The PLC shall meet the following standards: UL Listed, CSA Certified, and CE.

D. The PLC system shall have been designed and tested to operate in an industrial environment.

E. The PLC and I/O modules shall be of modular and rack mounted construction.

F. The system power supplies shall be protected against short circuits.

G. The PLC system shall be designed so that each control area operates totally independent of one another. Failure or loss of a controller shall not hamper the operation of any other controller.

H. Programmable controller manufacturer must guarantee the availability of replacement/spare parts for a minimum of ten (10) years.

I. All I/O modules and housings must be of a standard type and fully interchangeable with previous PLC series.

J. All controllers and I/O structures of a single manufacturer shall be capable of being mounted on the same size fixing centers to allow for larger capacity controllers to be installed in the future should the facility require an expansion beyond the limits specified in the original contract documents.

K. Controllers must be capable of driving local I/O racks, where local is defined as up to one hundred (100) feet from the control unit, without the need for further intelligent interface modules.

L. Each PLC shall control all input/output functions of the control stations and associated remote devices for the area served. Each PLC shall provide interface between the control stations and related systems. Each PLC shall be furnished with sufficient processor capacity and memory to meet or exceed interaction time as specified.

M. Racking System: Provide assembly with mounting slots for all modules required for electronic control system. Assembly shall include latching clamps or hold-down screws to secure modules in slots, dead front cover for covering I/O wiring terminals, and wire routing clips.
   1. Where multiple racks are required, provide bus expander unit to expand I/O capacity.
   2. Input and output modules shall be available in 16, 32, 64, and 96 points per unit. The 32, 64, and 96-point units shall not be multiplexed I/O and shall have a thumbscrew secured, high density connector capable of accepting individual soldered or crimped connector pins or ribbon cable via IDC type connector configuration.
   3. Provide rack system power supply as required for final system configuration.
   4. Provide 20% spare input and 20% spare output capacity in each rack assembly.

N. Processor: Provide processor module for installation in rack assembly. Processor shall include comprehensive self-test and self-diagnostic capabilities with dry contacts for remote monitoring in the event of controller fault.

1. Provide instruction set for control of quantity of input and output points as required by contract documents.
2. This project requires a minimum of one (1) processor plus spares as indicated.
3. Provide real time clock with accuracy within 1 second per day at 25 degrees C, 16 seconds per day over full temperature and humidity range.
4. Provide basic control logic instructions including but not limited to the following functions to provide operating features required by contract documents.
    a. Logical AND, OR, XOR AND INVERT
    b. On/Off Delay
    c. Counters
    d. Timers
    e. Sequencers
    f. Four Function Math (Add, Subtract, Multiply, Divide)
    g. BCD Input and Output
    h. Contacts
    i. Coils
    j. Block Instructions (conditional jumps)
    k. Group Logic Functions
    l. Array Math Functions
5. Provide memory capacity for control system as required by contract documents. Include a minimum of 20% spare memory capacity. Install lithium battery for memory support in the event of power failure.
6. System software shall be stored in EPROM. The operating software and fixed data base shall be stored in battery backed RAM.
7. Provide system trouble output contact for monitoring. Output shall occur upon any of the following conditions:
    a. Low battery
    b. Processor trouble
    c. Rack system trouble
    d. Enclosure open
    e. Power supply trouble

O. Input/Output Modules: Provide digital or analogue input/output modules as required for control system and field device connected. Modules shall plug in to rack assembly and contain 32 or 64 optically isolated inputs or outputs.
1. Provide red LED's indicators for "on" function.
2. Modules shall be 12-24 VDC for interface to electronic relay control.

P. Network Interface Modules: Provide module in each PLC for communications on the Ethernet ECSN.

Q. Communication Modules: Provide capability of driving local I/O, where local is defined as up to one hundred (100) feet from the control unit, without the need for further intelligent interface modules or additional power supplies.

R. Rack Power Supply: Provide duplex DC power supply to rack assembly to power all modules mounted in the rack. Connect to rack with power supply cable.
1. Include battery backup power to maintain random access memory (RAM) in the processor during power outages or power shutdown for a period of up to twelve (12) months.

2.4 PROGRAMMING

A. Programming of electronic control system shall be via the network. The programming software may reside on the Administrative Station of the Touch Screen Control and Management System, or provide a separate and dedicated computer for such purpose.

B. Provide software support for the Programmable Logic Controllers. Include capability for the following minimum functions:
   1. Password security.
   2. On-line program development and monitoring.
   3. Enter PID loop programming parameters
   4. Screen prompted processor programming instructions.
   5. Off-line processor program development.
   6. Copy all or part of off-line memory to processor memory and vice versa.
   7. Processor programming and monitoring by I/O labels.
   8. Advanced processor I/O diagnostics using TIME SCAN function.
   9. Coil verify capability.
   10. Annotated program documentation, with 18 character I/O labels and full page rung comments.

C. Report generation: Provide programming as required to meet requirements of Section 284623: Touch Screen Control and Management System

2.5 SYSTEM CONTROL AND MONITORING FUNCTIONS

A. Single Swing Door Lock with no-holdback feature requires continuous input to maintain unlocked.
   1. Control: Output unlock command causes door to unlock. Door will relock upon release of command
   2. Indication: Non-secure condition of door from lock bolt position or door position switch will open the input circuit.

B. Single Swing Door Lock with no-holdback feature requiring momentary input.
   1. Control: Output unlock command causes door to unlock. Lock bolt is held electrically retracted for a preset period of time (set at 3 seconds).
   2. Indication: Non-secure condition of door from lock bolt position or door position switch open the input circuit.

C. Single Swing Door Lock with mechanical holdback (standard lock configuration.
   1. Control: Output unlock command causes door to unlock. Lock bolt is held mechanically retracted until door is opened. Door relocks when door is reclosed.
   2. Indication: Non-secure condition of door from lock bolt position or door position switch will open input circuit.

D. Electric Sliding Door/Overhead Gate
   1. Control: Output OPEN command shall cause the door/gate to open until limit switch is opened or a STOP or CLOSE output command is received. Output CLOSE command shall cause the door/gate to close until limit switch is opened or an OPEN or STOP output command received.
   2. Card Reader Control:

a. At controlled and monitored sliding doors, presentation of a valid card shall cause door to open to a full open position, pause for one second and then recluse.
b. When door is in an open position (not secure), presentation of a valid card shall cause the door to pause for one second and close.

3. Indication: Non-secure condition of door/gate from limit switch or door position switch will open input circuit.

E. Door Monitor
1. Control: None.
2. Indication: Non-secure condition of door from lock bolt position or door position switch shall illuminate a red LED.

F. Door Alarms:
1. Door prop: Controlled/monitored door remains unsecured longer than the preset timer
2. Unauthorized Access: Controlled/monitored door becomes unsecured by means other than the control system.
a. Unauthorized Access alarms shall be programmed with a delay to prevent false alarm from a door bounce effect.

G. Interlock Override
1. Control: Output INTERLOCK OVERRIDE command shall allow door to unlock/open despite part of interlock group.
2. Indication: None.

H. Intercom or Paging
1. Control: Output AUDIO command causes previous audio command to be canceled (if necessary), zone select and audio “Listen” to be activated.
2. Indication: Input from local intercom call push button initiates call request.

I. Intercom Call
1. Control: Reset of call via Alarm Silence and Alarm Reset functions.
2. Indication: Input from local intercom call push button initiates call request.

J. ON/OFF Control
1. Control: Output of ON command turns on lights/receptacles, devices or equipment as indicated. Output of OFF command or removal of ON command turns off lights/receptacles or devices or equipment. Type of OFF control dependent on type of relay used.
2. Indication: Input from relay indicates contact status.

K. System Alarm: All system alarms shall be connected to NC contacts where provided.
1. Control: Reset of alarm via Alarm Silence and Alarm Reset functions.
2. Indication: Input from alarm contact shall open or close the circuit.

L. Provide interface between ECS and Access Control System to enable control of selected doors by both systems.
1. Electronic Control System Enable/Disable and Override:
a. The Access Control Panel door output controls for detention doors with card readers shall be connected as inputs to the Programmable Logic Controller for door control. The Access Control System outputs SHALL NOT be directly connected to detention locks or devices unless specifically indicated otherwise.
b. The PLC control for detention door shall always be able to override a command from the Access Control System.

c. For doors that are connected to both the PLC and to the Access Control System, door control commands, status and alarms shall be recorded by both the Access Control System the PLC.
d. When Enable function located on the control station is depressed, doors can be open by a card reader. The signal from the card reader will go to the local access control panel for evaluation if access through that door will be granted or denied based on access control system defined criteria. If access is granted by the Access Control System, then an output control signal shall be transmitted from the local access control panel to a PLC input. If the PLC logic determines that access is authorized, then an output signal shall be provided from the PLC I/O that causes the door to unlock or open.
e. If the card reader has been DISABLED from the control station, the PLC shall ignore any input signal received from the Access Control System (through any means, such as card reader, REX, or operator command from an ACS workstation) requesting any door controlled by that control station be opened.

2.6 RELAY INTERFACE

A. Provide relay interface between control system and all controlled devices.
1. Wire Connections: Wires shall be attached to the relays by means of cable-clamping terminal block activated by a screw. Connections shall be gas-tight and the terminal block shall be fabricated of non-ferrous, non-corrosive materials.
2. Equipment: relays shall include an integrated label holder that can be used to mark the device. Relays shall have indication of operation by way of an LED (Light Emitting Diode). Relays shall incorporate a free-wheeling diode to eliminate inductive kick-back. Isolation voltage of 4000 kV, 50 Hz, 1 minute shall be provided between input and output.
3. Provide current overload protection, surge suppression, LED indication of status, and troubleshooting features.
4. Relays: Electro-mechanical type, single or double pole, double throw.
   a. Current rating: 125% of inrush current rating of device controlled, but not less than 10 amps. Rating for pneumatic lock relays not less than 3 amps.
   b. Coil Voltage: 24 VDC or as required by application.
   c. Contact voltage: 24 VDC or 120 VAC as required for application.
   d. Isolation: 2500 VAC.
5. Provide surge protection on load side of each relay connected to a locking device, from normally open contact to ground
6. Provide individual overcurrent protection (fuse, circuit breaker) for each relay serving an electro-mechanical locking device to protect relay and system circuitry from a short circuit failure at the lock.
7. Where relay systems are made up of modular components for DIN rail mounting, all wiring points and plug connections shall be “touch safe” with no live voltages in accordance with IEC 529.
   a. Mounting: all relays shall have integral mounting brackets to attach to 35mm DIN-rail conforming to DIN EN50022.
   b. Wire Connections: wires shall be attached to the relays by means of cable-clamping terminal block activated by a screw. Connections shall be gas-tight and the terminal block shall be fabricated of non-ferrous, non-corrosive materials.
   c. Equipment: relays shall include an integrated label holder that can be used to mark the device. Relays shall have indication of operation by way of an LED (Light Emitting Diode). Relays shall incorporate a free-wheeling diode to eliminate inductive kick-

back. Isolation voltage of 4000 kV, 50 Hz, 1 minute shall be provided between input and output.

8. Integrated boards specifically designed for detention equipment control systems will be considered under limited conditions.
   a. Boards must be in production for a minimum of 5 years without substantial modification.
   b. Company must be operating a minimum of 10 years under the same name.
   c. Boards shall be stocked and available for next day shipping.

B. Provide relay interface between electronic control system and all other Divisions of work. Relay interface shall be programmed to meet the requirements of the controlling device of the related trade. For momentary double throw control, provide programming for alternate action. For exact relay schedule provided by Div 26 refer to drawing Detail 3/E312.
   1. Relays: Electro-mechanical type, single pole.
      a. Current rating: 4 amps.
      b. Coil Voltage: 24 VDC
      c. Contact voltage: 12 VDC or as required for application.
   2. Controlled circuits include:
      a. Receptacles
         1) Dayroom
      b. Lights
         1) Cells (group of cells in one dayroom)
         2) Dayroom (overhead, walkway)

C. Label all relays and terminations with designations to match installation and maintenance drawings.

D. Optional: Data interface using standard industry protocol for data communication (e.g. BACfnet) between electronic security system and control systems provided by Div 26 contractor such as detention area lighting control and power control etc

2.7 DURESS ALARM

A. Duress Alarm Station (wall mounted)
   1. Furnish and install a pushbutton switch at duress locations as shown on drawings. Switch shall be flush mounted in a single gang box with an engraved single-gang stainless steel faceplate.
   2. When switch is momentarily depressed, the system shall cause the duress alarm warning light for that area to illuminate, visual and audible annunciation at the designated control station, and printing on the system terminal.
   3. Pushbutton switch shall be industrial type switch with red mushroom head and integral key reset switch. Engrave plate with “PUSH FOR HELP”.
   4. Key activated reset switch on Duress Call-In Station shall for deactivate Duress Call-In and extinguishing Duress Alarm Light.
   5. Model:
      a. Dortronics Systems Inc. 5210-MP23/KR/L1/E2
      b. Or Equal

B. Duress Alarm Station (desk mounted)

1. Desk mounted duress alarm push button shall be a mechanical hold-up switch designed for silent operation. Pushbutton activated by using one finger to press down on the switch. When activated, the switch mechanism locks, insuring an immediate alarm signal. A status window designed on top of the hold-up switch shall indicate its condition: RED (alarmed) and BLUE (armed). Key reset switch and metal housingThe housing is made of metal.
2. Model:
   a. HUSK-20 or equal

C. Duress Alarm Strobe Light
   1. Furnish and install a strobe light visual alarm where indicated on drawings. Mount strobe light on stainless steel back plate.
      a. Federal Signal Corporation Visalert VALS with red lens

2.8 EXIT PUSHBUTTONS

A. Provide exit pushbuttons for local release of electrically operated locking devices.
   1. Pushbutton switch mounted on 11 GA steel plate. Steel plate shall be engraved with “PUSH TO EXIT”
   2. Faceplate shall secure to a standard single gang electrical box.
   3. Pushbutton switch: A single pole, single throw, momentary dry contact, moisture and damage proof.
   4. Model: (Similar to the following used for intercom call)
      a. Dortronics NWR5276-HD22
      b. Or Equal

2.9 ENCLOSURES (SEE SECTION 280555)

A. Install all components of control system in NEMA 1 enclosures with hinged doors(s), handle and key lock. All enclosures keyed alike.

B. Install engraved nameplate on each enclosure with system designation.

C. Provide door switch for alarm input to electronic control system.

2.10 WIRE AND CABLE

A. All Class 1 wiring shall be building wire of type specified in Division 26 work. Provide overcurrent protection for conductors in accordance with NEC. Minimum sizes as follows:
   1. Indication: 18 GA minimum.
   2. Control: 14 GA minimum.

B. All Class 2 wiring may be single conductor or multiple conductor cables. Conductors to be stranded type tinned copper, 22 GA minimum, PVC insulated.

C. Wire for low voltage electro-mechanical locks shall be in sized to provide rated voltage at lock. Minimum wire size for 24VDC locks shall be as follows.
   1. Less than or equal to 200 feet of wire from power supply to lock: 14 gauge.

2. More than 200 feet and less than or equal to 360 feet of wire from power supply to lock: 12 gauge.
3. More than 360 feet and less than or equal to 570 feet of wire from power supply to lock: 10 gauge.

D. Data cable for Ethernet connections shall be Category 5e/6. Limit cable lengths to 100 meters maximum.
1. Data Cable: Unshielded 4-pair, shall exceed all requirements for ANSI/EIA/TIA-568-A-5 and support high speed communication network applications.
a. Category 5e:
1) Belden: 1594A – Dry, 7997A – Wet
2) West Penn: 4245 – Dry, M57561 – Wet
3) Comscope: 5EN5 – Dry, 5NF4 – Wet
b. Category 6:
1) Belden: 7881A – Dry, Wet not available
2) West Penn: 4246 – Dry, M57562 – Wet
3) Comscope: 75N4 – Dry, 6NF4+ – Wet

2.11 POWER SUPPLY (SEE SECTION 285045)

A. Provide power supplies as required for control and indication functions. Power supplies shall conform to requirements of NEC Article 725. Provide overcurrent protection of primary and distribute secondary overcurrent protection for secondary wiring circuits.
1. Class 1 power supplies shall be provided with overcurrent protection as required by NEC Article 725. Provide overcurrent protection for all conductors in accordance with ampere rating. Minimum conductor size served by a Class 1 power supply shall be 18 GA.
2. Class 2 power supplies shall be power limited and/or overcurrent protected in accordance with NEC Article 725. Nameplate rating of power supply shall not exceed limits indicated in NEC Article 725. Minimum conductor size served by a Class 2 power supply shall be 22 GA.

B. Power supply selection:
1. Load on power supplies shall not exceed 90 percent of nameplate rating of power supply.
2. Size power supplies for nameplate ratings of each connected device and equipment item connected.
3. Power supplies for 24 VDC locks shall be provide in sufficient quantity for simultaneous emergency release of all cell doors within at Housing Unit/Dayroom. Provide a minimum of one power supply for the lesser of each 32 locks or each dayroom.

C. Power Supplies shall be fully enclosed and provide screw terminations for wires. Wires shall be attached by means of a cable-clamping terminal block. Connections shall be gas-tight and the terminal block shall be fabricated of non-ferrous, non-corrosive materials.

D. All wiring points and plug connections shall be “touch safe” in accordance with IEC 529. Housings shall be fully enclosed with a rating of at least NEMA1.

E. All power supplies shall have integral metal mounting feet to attach to 35mm DIN-rail conforming to DIN EN 50022.

F. Power Supplies shall conform to CE electromagnetic compatibility as described in EN50081-1 and EN 50082-2.

G. Power supplies shall be capable of being run in parallel mode without external circuitry to prevent load competing.

H. Power Source (120 VAC) for equipment shall be provided by Division 26. Provide terminals for all incoming circuits provided. Distribute load equally among all circuits provided.

I. Where groups of doors are operated with a single action, divide doors into sub-groups of eight doors or less and provide time delay between each sub-group.

2.12 SPARE PARTS (SEE SECTION 280510)

A. Deliver spare parts in protective wrapping and packaging for proper storage.

B. Provide the following spare parts.
   1. Programmable Logic Controller:
      a. Processors, Hot Swappable Fully programmed: one of each type (1).
   2. Relays: Fifty of each type used (50), four of each type relay board used (4).
   3. Fuses: Fifty of each type used (50)
   4. Power supply: Two of each type used (2)
   5. Duress alarm stations: Two (1)

PART 3 - EXECUTION

3.1 INSTALLATION (SEE SECTION 280510)

A. Provide direct supervision of installation of electronic control system at project site.

B. Clean area to receive electronic control system prior to installation.

C. Connect all field wiring to terminal blocks provided. Verify all labeling and coordinate with record documents.

3.2 TESTING (SEE SECTION 280510)

A. Testing Specifications for each fiber optic cable:
   1. All of the following test shall be performed on each fiber in each cable installed and each test results shall be provided in written form
   2. End to end attenuation test with power meter. Maximum attenuation on installed cables / fibers shall be within the manufacturer’s specifications.

B. The testing of both windows of each fiber optic cable.
   1. If splicing of a fiber optic cable is required due to site conditions, each fiber in the associated cable shall be tested using an Optical Time Division Reflectometer (OTDR). All testing information and locations of each splice shall be in written form and provided with the as-build documents. The following items must be tested on each fiber associated with a splice.
      a. Test each strand on one wavelength in one direction on each segment, no jumper allowed, and document.

b. Test for overall continuity and document.
c. Verify the length of each segment and document.
d. Locate and indicate all splices on drawings.

3.3 WIRING (SEE SECTION 280510)

A. Within consoles: point-to-point with appropriate terminal connections for every wire and component termination.
   1. All connections mechanically secure.
   2. All wiring and terminals clearly identified to facilitate connection of field wiring.
   3. Field wiring shall be terminated on IEC style terminal blocks capable of being mounted on 35mm rail conforming to EN 50022.
   4. Terminal blocks shall be “touch safe” in accordance of IEC 529 where no live voltage can make contact with a misplaced finger.
   5. Terminal blocks shall be capable of being installed side by side, with no gap or air space required for heat dissipation.
   6. Terminal block metal parts shall be made of a non-corrosive material.

B. All cable and wire within console to be standard type available from multiple manufacturers.

C. All electrically operated locks and locking devices shall be grounded. Provide green ground conductor. Connect to ground conductor or ground lug at lock or lock device. If a conductor or lug is not provided with the lock or locking device, install a ground lug on the lock case and connect to ground.

D. Wiring shall be installed in strict accordance with NEC Article 725.

3.4 OWNER PERSONNEL TRAINING (SEE SECTION 280510)

A. Provide training of owner personnel in proper operation and maintenance of electronic control systems.

B. Training Outline-Maintenance Staff
   1. Systems Operation
   2. Component Review
   3. Routine Maintenance/Adjustments
   4. Troubleshooting/Repair
   5. Expansion Capabilities
   6. Software Overview

END OF SECTION

SECTION 284623

TOUCH SCREEN CONTROL AND MANAGEMENT SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. General:
   1. Furnish all labor, materials, tools, equipment, and services for a touch screen control and management system as indicated in accord with provisions of Contract Documents.
   2. Completely coordinate with work of all other trades.
   3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
   4. See Division 01 for General Requirements.

B. Related work specified elsewhere:
   1. Common Work Results for Electronic Security: Section 280510
   2. Cabinets and Enclosures: Section 280555
   3. Access Control System: Section 281300
   4. Digital Video Management System: Section 282300
   5. Electronic Control System: Section 284619
   6. Uninterruptible Power System: Section 285045
   7. Digital Intercom and Paging System: Section 285123

1.2 BASIS OF DESIGN

A. Touch screen control and management system shall provide the means to control and monitor all security devices in the facility via the electronic control system. Additionally it shall provide archiving of events to a database with ability to generate reports from that database.

B. The system shall consist of multiple new Touch Screen Control Stations, an Administration Station, a File Server, and a report printer. The touch screen control stations, the administration station, and the file servers shall be connected to an Ethernet network for communications and control.

C. The system shall consist of multiple new Touch Screen Control Stations, an Administration Station/File Server, and a report printer. The touch screen control stations, the administration station/file server shall be connected to an Ethernet network for communications and control.

D. The touch screen control system shall be configured to allow control transfer between the stations so that any touch screen station in the facility can control and monitor complete facility.

E. The touch screen control stations shall be for the purpose of control and monitoring of security systems in the facility. The Administration Station/File Server shall be used for administrative functions such as diagnostics, software and file back-up, system restoration, storage of all

database information, restoration of touch screen stations, and software back-ups, report generation, etc.

F. The graphic display system on the touch screens shall consist of welcome and log-on screens, floor plan screens with control icons, utility screens for miscellaneous functions and other screens for supporting functions.

1. The welcome and log on screens shall provide the ability for operators to log on via a password and such information will be available via the data base for retrieval of information as to the person operating the stations at any given time of day.
2. The utility screens shall provide general functions such as emergency release, local control disable, card reader activation, etc
3. Building floor plan screens will illustrate all areas of the building, display the status of all security systems in the building and allow control of all security system devices. Control shall be by selection using touch or a pointing device (i.e. mouse, trackball). Movement icons shall be provide for movement to screens depicting adjacent areas as well as areas above and below on multi-level applications.

1.3 QUALITY ASSURANCE (SEE SECTION 280510)

1.4 SUBMITTALS (SEE SECTION 280510)

A. Electronic files of the electronic systems floor plans will be made available to the electronic system integrator upon request for the purpose of development of touch screen maps and other submittal requirements. A release form will be required to obtain the files.

A. Touch Screen Control System: Section 284623
1. Project data: Description of system operation indicating purpose and capabilities of each component of system with functional system diagram indicating all interfaces to other systems. Description shall include, and call attention to, all variances from the contract documents.
2. Shop drawings: Complete installation drawings including system diagrams and terminal point to terminal point wiring diagrams.
3. Product data: Technical data sheets and specifications for each component.

B. Touch Screen Presentation and Display System: Section 284623
1. Shop drawings:
   a. Full size layout of each graphic map.
   b. List of system integrator suggested modifications to graphic maps.
   c. Design of custom control stations.
   d. Theory of Operation describing all functional operations of the system.
2. Demonstration: Two operating touch screen stations shall be provided for the purpose of review of the presentation and display system. The stations shall be networked in order to demonstrate task group management features. Each function of the system shall be emulated via function keys.

a. Upon preliminary approval of the graphic maps, the Electronic Systems Integrator shall fabricate and program two networked touch screen control stations with all maps, icons, and functions as required by these contract documents.
b. Engineer Demonstration: The Electronic Systems Integrator shall set up the stations at the offices of the Engineer and demonstrate the operational capabilities. The stations shall remain at the offices of the Engineer for a minimum period of four weeks. At the end of the review period, the Engineer will provide the Electronic Systems Integrator with a listing of modifications and/or adjustments deemed appropriate for the proper operation of the unit.
c. Upon completion of the Engineer review, the Electronic Systems Integrator shall remove the unit from the offices of the Engineer and make all modifications and/or adjustments listed by the Engineer. If re-submittal is required, the Electronic Systems Integrator shall send updated software with instructions for loading and making operational or install updated software as necessary to allow review of revised operation.
d. Owner Review: Upon completion of the modifications and/or adjustments listed by the engineer, the Electronic Systems Integrator shall set up the station at the offices of the Owner and demonstrate the operational capabilities. The stations shall remain at the offices of the Owner for a review period of 30 days. At the end of the review period, the Engineer will provide the Electronic Systems Integrator with a listing of modifications and/or adjustments deemed appropriate for the proper operation of the unit.
e. Upon completion of the Owner review, the contractor shall make all modifications and/or adjustments listed by the Engineer and update the demonstration stations with software and hardware as required. If re-submittal is required, the Electronic Systems Integrator shall install updated software as necessary to allow review of revised operation. The demonstration stations shall remain at the offices of the Owner.

3. Completion of the submittal review for this portion of the work shall not be construed as an approval of the presentation system. Modifications and adjustments shall be provided as needed after installation and field testing on site.

1.5 WARRANTY (SEE SECTION 280510)

1.6 OPERATING AND MAINTENANCE DATA (SEE SECTION 280510)

A. Provide original copy of all software manual and disks.

B. Provide back-up media for final installed applications prior to final completion. Provide a bound manual for back-up procedures for each computer station.

PART 2 - PRODUCTS

2.1 GENERAL

A. Manufacturers:
   1. CPU:
      a. Base: Dell, Hewlett Packard
   2. Monitors:

a. Base: Dell, ELO, Samsung
3. Touch Screen interface:
   a. Base: Elo Touch Systems
4. Printer:
   a. Base: HP,
   b. Graphic User Interface:
   c. Aveva (Wonderware) Intouch HMI 2020 or later
   d. Aveva Edge (InduSoft WebStudio) 2020 or later
   e. Software listed above may not provide all functionality required by these specifications. Provide third party software applications where required to provide specified functionality
   f. The function based presentation and management system described herein has been developed in prior applications using Wonderware. Use of another listed Graphic User Interface shall be verified by the Electronic Security Systems Integrator that the specified presentation and management system can be successfully developed to meet this specification.
   g. Contractor must use the latest HMI software platform, fully compatible with Windows 10 and Server 2019 and SQL Server 2019 Standard or later.
5. RDBMS software: (latest edition)
   a. Sequel Server 2019 Standard, or later
6. Other manufacturers desiring approval comply with Division 01.

2.2 TOUCH SCREEN CONTROL AND MANAGEMENT SYSTEM

A. General:
   1. Acceptable Touch Screen Control & Management System: The specifications herein represent minimum criteria and do not necessarily describe each and every function of a touch screen control system. Complete functions for the touch screen control system will be developed in conjunction with the successful Electronics Systems Integrator during the submittal process. Completion of the submittal process should not be considered as final approval of the system. Final approval of the system will only come as a result of all field devices and equipment being installed and demonstrated to meet requirements of contract documents with clarifications in submittals.
   2. Abbreviations:
      a. TS - Touch Screen Station(s)
      b. ADS/FS Administration Station/File Server
      c. GUI Graphical User Interface
      d. HMI Human Machine Interface
      e. RDBMS - Relational Database Management System
      f. SQL Sequential Query Language
   3. Latest anti-virus program(s) shall be provided to protect all software integrity and inform operator of possible corruption. All software shall be provided immune from known viruses.

B. Description:
   1. Provide a complete, fully integrated control and monitoring system for man-machine interface at locations indicated on the drawings utilizing TS and ADS/FS connected to the Network. Each TS shall be capable of complete individual and simultaneous facility control and monitoring. Provide all labor, materials, equipment, software, programming,

and supervision to configure, integrate, install, program, calibrate, adjust, demonstrate, train, test, warrant, and maintain the total system.

2. All electronic security systems devices shall be controlled, monitored and displayed on graphic screens by the touch screen control and management system.
3. The touch screen control and management system shall be compatible with the Network and function in conjunction with all electronic security systems to display, control and monitor all devices and functions in a GUI environment.
4. Pre-recorded audio messages shall be linked to alarms based on alarm type, and alarm location. Audio message content shall be selected by the User. Audio messages shall be submitted by Integrator for review and approval as part of submittal requirements of Touch Screen Presentation and Display System.
5. The interaction time between system input at the touch screen and the activation of a field device shall not exceed one half (0.5) second. Similarly, the interaction time between field input device and display on the touch screen shall not exceed one half (0.5) second.
6. The interaction time to recall a complete graphic map shall not exceed one (1.0) second under normal operation and two (2.0) seconds under single station control of entire facility.
7. No increase in reaction time for the system shall be acceptable due to multiple screens on line or due to combination of functional areas.
8. Provide software tools, and all information needed for user modification of maps and text on graphic displays. Include capability of editing the activity descriptions.
9. Recovery of TS Stations and Administration Station/File Server (ADS/FS) shall be accomplished via the Network. A complete data copy of each individual CPU shall be maintained. The administrator shall have the option of recovering the remote station with the original backup media, or the monthly archived media backup. Backup and recovery procedures shall not effect system performance. Archive command selection shall be user friendly with prompts to guide the administrator through the backup/purge process for each station and system via ADS/FS. Complete backup and restore procedures for “all systems” shall be from the Administration Station.
10. All equipment and software shall be readily available for purchase directly from the original equipment manufacturer other than the Electronics System Integrator.

C. Computers

1. All computers shall be of common manufacturer, assembly and features.
2. Each item of equipment or device that makes up a computer shall be of the same manufacturer. That is to say that all drives shall be of the same manufacturer and all CPU’s will be of the same manufacturer, etc.
3. Computer minimum features:
   a. Case and power supply:
      1) TS Stations:
         Touch Screen PCs: Precision 3460 Small Form Factor Workstation with dual VESA monitor mount with adapter bracket.
      2) ADS/FS: 1U or 2U Rack Configuration with redundant hot plug Platinum 350W minimum server grade Power Supplies. Minimum Dell PowerEdge R440 or equal.
   b. Operating System:

      1) TS Stations: Windows 10/11 Pro for Workstations up to 4 Cores.

      2) ADS/FS: Windows Server 2019 Standard or later. Server Essentials version is not acceptable.

c. Microprocessor:

1) TS Stations:

a) Touch Screen PCs: 12th Gen Intel® Core™ i7-12700 (25 MB cache, 12 cores, 20 threads, 2.10 GHz to 4.90 GHz Turbo, 65 W

2) ADS/FS: Intel Xeon Silver 4208 8C or better, operating speed of 2.1G, 16T, 11M cache, Turbo, HT (85W)

d. Memory:

1) TS Stations (all): 16 GB, 2 x 8 GB, DDR5, 4800 MHz

2) ADS/FS: 32GB of DDR4 or better ECC memory only.

e. Data Storage / Optical:

1) TS Stations (all): 512 GB, M.2, Gen 4 PCIe NVMe, SSD, Class 40.

2) ADS/FS: RAID 1 OS Drives (2) 256GB SSD minimum, RAID 5 Storage (3) 1 TB hard drives 7.2k SATA drives minimum. One 8X DVD+/- RW optical drive, or better.

f. Graphics:

1) TS Stations (all): Intel integrated Graphics

2) ADS/FS: On board graphics.

g. Audio: 32-bit multimedia sound package with speakers for playing voice messages or sounds (wave files).

h. Network: TS: 1000 Ethernet. ADS/FS: Dual 1000 Ethernet ports.

i. Printer ports: Number and type to support specified printers

j. Monitors:

1) 27” Touch Screen Station: 27” LCD TFT Active Matrix, 1080P, 16.7 million colors, contrast ratio 1000:1, response time 14 ms, touch screen, viewing angle of 89 deg (up/down/left/right). Touch Pro PCAP – use dual VESA mount for PC. Use separate adjustable stand if required.

2) ADS/FS: 17” LED/LCD, 1080P Resolution, 16 million colors; Rackmount Keyboard Monitor Mouse (KMM) is an integrated keyboard, 17" monitor, and mouse in a compact 1U design, which allows a KVM switch to be mounted in the rear of the device. The rackmounted unit shall be provided with integrated 8 port KVM switch.

k. Provide wired pointing device for operator selection of all functions. (i.e. Trackball, laser mouse, etc.) Provide a mouse pad for each device.

l. Provide equal to Dell ProSupport Plus and Next Business Day Onsite Service for 36 months with the ability for owner to keep their harddrive.

m. Disable unused USB drives for TS stations – provide password protection to enable.

D. System Administration Station and File Server (ADS/FS):
1. The system shall include a system administration station for the purpose of assignment of parameters, report generation, software loading, network administration and diagnostics. In addition it may include compatible software for programming other systems including but not limited to the following:
   a. Digital Intercom and Paging System. See Section 285123
   b. Electronic Control System Programmable Logic Controllers. See Section 2846192
2. Provide printers for reports and hard copy logging.
   a. Provide laser printer (HP LaserJet or equal) for report printing.
3. Administrative functions to be provided on ADS/FS shall include the following.
   a. Priority levels shall be established for each alarm and device input. The assignment and changing of parameters shall be accessible from the ADS only under the System Manager password or higher access level.
      1) Life safety alarms (i.e. fire)
      2) Personnel alarms (i.e. duress, audio)
      3) Security alarms (i.e. exit or security barrier doors, unauthorized access, door prop)
      4) System alarms (i.e. UPS, electronic control system. communication faults, network alarms)
      5) Administrative intercom calls (i.e. control station, watch commander, jail captain, warden, shift supervisor)
      6) Movement intercom (i.e. sallyports, elevators, corridors)
      7) Reminder alarms
      8) Inmate intercom (i.e. cells)
      9) Acknowledged alarms
   b. Each user shall be assigned a unique User ID and Password to access a touch screen station for operation. System shall be configured for no less than eight user access levels.
      1) Maintenance: Full and unlimited access.
      2) Administrator: Full access except diagnostics maintenance and repair duties. It shall include access for data archival, back-ups, and all privileges of lower access levels.
      3) Systems Manager: Access to modifications of parameters, timer task groups, default set-ups, and all privileges of lower access levels.
      4) Supervisor: Operations of lower access levels plus ability to change task group assignments.
      5) Operator: Operation of all TS control and monitoring functions.
   c. Reference timers and assignment of devices to reference timers shall be provided. Provide twelve reference timers (5 sec., 10 sec., 15 sec., 20 sec., 30 sec., 45 sec., 60 sec., 90 sec., 120 sec., 5 minutes, 10 minutes, 15 minutes).
   d. Each alarming device (i.e. door, intrusion detection) shall be capable of having its functions, alarm and reminders individually adjusted by the user on the ADS.
   e. Special functions shall be provided for use during construction, testing and start up phases of the work.
      1) Provide the capability to reset groups of door alarms via the utilities menu. Reset of door alarms shall be by functional area and global (entire facility).
      2) Provide the capability to disable groups of door alarms via the utilities menu. Disable of door alarms shall be by functional area and global (entire facility).

f. The ADS/FS shall synchronize all clocks in the electronic security systems on a daily basis, including but not limited to the following:
   1) Digital Intercom and Paging System
   2) Programmable Logic Controllers
   3) Touch Screen stations
   4) Access Control System
   5) Digital Video Management System

4. Report Generation:
   a. Archival reports of all alarms stored in the ADS/FS for a minimum period of sixty (60) days with automatic back-up to server hard drives and manual backup to external hard drives.
   b. Provide operations and maintenance reporting capabilities to include user definable pre-formatted report generation capable of accessing, retrieving, formatting, printing, and display of data developed for reports. This information shall be automatically and manually (user selected) imported into the RDBMS (SQL) and made available for report generation. Provide report generator software.
   c. Provide capability for automatic and manual archive of system history/data to backup media. Provide capabilities to purge and merge data automatically and manually based on administrative command.

E. Touch Screen Stations (TS):
1. Touch Screen Overlay – Surface Acoustic Wave
   a. The surface acoustic wave overlay shall utilize a single glass panel design with no front layers or coating. Touch point activation shall be by piezoelectric transducers attached to the corners of the touch screen assembly.
   b. The surface acoustic wave overlay shall have a minimum light transmission from the attached video display of ninety two percent.
   c. The position accuracy shall have a maximum error of 0.125 inches regardless of screen size.
   d. Overlay durability shall be a minimum of two million touches with a finger at any given point and regardless of screen size.
   e. Maximum activation force shall be twelve ounces and shall have the capability (through software) of setting the activation force from one ounce to the maximum.
2. Communications interface console. See Section 28 5123
3. The ADS/FS shall provide all necessary operations to control, monitor and record and archive all control and monitoring events. The ADS/FS shall provide the platform to edit the configuration of the Touch Screen Control and Management System.
4. The ADS/FS shall be fitted with all necessary interfaces necessary for integration to the ECSN.

F. Keyboard/Video/Mouse Switch:
1. Provide a Keyboard/Video/Mouse switch for common control of multiple CPUs in the security equipment room.
   a. Administration Station/File Server (ADS/FS)
   b. Access Control System: See Section 28 1300
   c. PLC Programming Computer: See Section 28 4619
   d. Video Management and Recording System: See Section 28 2300
2. Black Box Corporation: KV108A-R3 to accommodate up to eight (8) CPUs with rack mount kit where applicable.

G. Software:
1. All user licenses, software, original software media, manuals, etc. shall be turned over to the Owner at completion of the project. All project specific application software shall be transferred at the end of the warranty period. Provide fireproof, waterproof lock box of size suitable for storage (4 drawer file cabinet) of all manuals and software.
2. Where network integration software is used, it shall be non-proprietary in nature and readily available for purchase from sources other than the Electronic Systems Integrator.
3. Provide all software patches, custom programming and modifications to listed GUI as required to meet operational requirements specified herein.
4. Provide log-on security password for ADS/FS and TS. Provide a minimum of 64 levels of password protection. The software shall include a RDBMS for access to a minimum of 1024 users.
5. Support pre-formatted report printing capabilities with on-line utilities to edit and update database(s), report generation, alarm tags, point descriptions, etc. These utilities shall be protected by security level(s) and password protection.
6. All drawings, programs, etc. shall remain confidential and the property of the Owner.
7. Touch screen Operator Interface (GUI) Software / Human Machine Interface(HMI)
   a. The GUI/HMI utilized shall be a commercially available development HMI package operating in a Microsoft™""operating system environment. The software shall be programmed to the specified functions and features described in the contract documents.
   b. Have an open architecture that allows the system to run in a multitasking environment with support for on-line dynamic data exchange with other applications such as expert systems, spreadsheets, and database (RDBMS/SQL) programs.
   c. Allow quick and easy modification of the end application by users in the field.
   d. Support distributed access through the alarm and historical modules as well as application development and transfer across a network with built-in Network Application Development (NAD) functionality.
   e. Be able to access multiple data sources/items with a single tag name using functionality of built-in Dynamic Reference Addressing (DRA)
   f. Support internally as well as third-party pre-animated graphical objects developed using tool kit provided by original HMI /OEM.
   g. Have display elements such as real time and historical trends, alarm summary displays, bit map images, SPC charts, and shall be configurable with the capability to be placed in any window in any configuration.
   h. Have a graphic drawing system that is object orientated which allows the user the capability to arrange objects. (i.e. Align Top, Align Bottom, Align Left, Align Center Points, Space vertical, Send to Front, Send to Back, Space Horizontal, Rotate, Group objects into a cell)
   i. Be able to configure graphic screens while the system is monitoring the process.
   j. Utilize the maximum resolution and colors of the monitor to enhance and simplify the displayed control and status information. Minimum resolution shall be 1024 x 768 with 256 colors.
   k. Be capable of operating under Microsoft™ “Windows” multi-tasking operating system.
      1) Server: Microsoft Server 2016 or 2019
      2) Workstations: Microsoft Windows 10 Professional
   l. Touch screen HMI baseline software application and GUI shall be developed with the latest tested and released version of the development package
8. Control management software shall be provided to monitor status of all control stations on the network in order to support transfer of control stations that are disabled.

a. When a control location becomes disabled, the control system must transfer control to the next active hierarchical control station. This transfer of control must be automatic once the system has determined the control station is no longer active. Disabling of a control station shall include, but not be limited to; a user log off, automatic disabling by the control system due to local duress alarms, remote disabling by a higher level control station, loss of power to the control station including power failures or depletion of battery power, and intentionally or unintentionally turning off of the control station.
b. Additionally, the higher station must have status of subordinate control stations available in order to meet the monitoring and control functionality required for all control locations.

H. Power Supply: See Section 28 5045
1. All equipment and all systems required to provide a fully functional touch screen control, management and display operation shall be powered from uninterrupted power systems
2. System shall be sized to allow operation for a minimum period of twenty (20) minutes without normal/emergency building power applied. All functions shall be maintained 100% during this time.

I. Spare Parts:
1. Deliver spare parts in protective wrapping and packaging for proper storage.
2. Provide the following spare parts.
a. One complete TS station (PC and Monitor) programmed to be added to the system.
b. Two pointing devices

J. All applicable components shall meet FCC Class B Computing Device standards and be U.L. and C.S.A. listed.

2.3 TOUCHSCREEN PRESENTATION AND DISPLAY SYSTEM

A. The goal of the presentation to the touch screen operator is to provide intuitive operations through visual simplicity, fast orientation, similarity of functions and ergonomics. Consideration shall be given for operators that are visually color impaired.

B. Graphic displays shall be created for welcome, log-on, utilities, special functions, and building floor plans of all areas of the facility, including site conditions. The display system shall convey an accurate plan of all areas of the facility. Salient characteristics pertaining to colors, icons, and graphics shall be confirmed during the submittal process. The cost of modifications during the submittal process and through substantial completion is the responsibility of the Electronic Systems Integrator.

C. Graphic screen hierarchy and access shall be both operator and event driven. The system shall allow the operator to move between functional area maps via the floor, building and site maps, and move between maps within a functional area by touching the area of the functional map that is desired. The system shall also allow events to drive movement between screens.

D. The presentation and display system described herein is preferred, however the integrator's typical display system may be used in lieu of that specified herein provided that the functionality of such include equivalent functionality to that specified and meets all requirements of applicable

codes. Submission of alternate presentation and display system shall include a compliance matrix comparing or contrasting the proposed functionality and the specified functionality.

E. Display icons:
   1. General:
      a. Control of functions shall be accomplished by the touching of icons on the graphic video display. Touching of an icon shall initiate an audible beep for confirmation.
      b. Each icon shall be distinct for its assigned function and consist of symbols and colors. Each change of status shall include that for both selection (confirmation of touch input) and verification (confirmation from controlled device).
      c. Icons shall be created so that change in state is indicated by both color and graphical change.
      d. All control icons (switch functions) used shall be of size that will facilitate a positive touch point. The minimum size shall be 0.375 inches square. Status indicators for intercom, doors, card readers, keypads, etc., shall be a maximum of 0.250 inch in diameter, or equivalent square, triangle or rectangle. Status indicators for duress alarms and other alarms shall be a minimum of 0.250 inches in form, diameter, or equivalent square, triangle or rectangle.
      e. A date and time function shall be displayed continuously in same location on all screens. All clocks shall automatically update and synchronize from the ADS/FS. Reset of system date and time shall be accomplished globally from the ADS/FS.
      f. Each map shall be titled and numbered for reference in the same location on all screens.
      g. A key plan of the building or site shall be displayed in the same location on all screens. The key plan shall be segmented by functional area. The functional area represented on the screen shall be shaded on the key plan to indicate location of area displayed with respect to the building or site.
   2. Graphic colors and text shall be chosen to meet the goals of the display system and emulate passive presentation systems.
      a. Icons shall be gray in color when secure or inactive. Icon colors for alarm or non-secure conditions shall be distinct in color as described elsewhere in these specifications.
      b. Interlocked areas shall be shaded gray to allow recognition of interlock conditions
      c. The architectural room names shall be placed in each room on each screen to facilitate review and coordination of work. These labels shall be toggled on/off by function key on the TS keyboard. A separate function key shall be provided for each group of labels.
      d. The architectural room numbers shall be placed adjacent to each room name on each screen to facilitate review and coordination of work. These labels shall be toggled on/off by function key on the keyboard. A separate function key shall be provided for each group of labels.
      e. The architectural door numbers shall be placed adjacent to each door on each screen to facilitate review and coordination of work. These labels shall be toggled on/off by function key on the keyboard. A separate function key shall be provided for each group of labels.
      f. Room names and numbers to coordinate with the Owner/User's signage shall be inserted into maps. Such names and numbers will be confirmed or identified in the submittal phase.
      g. Text shall be of uniform font and size.
         1) Room names and general text: 12 pt.
         2) Room numbers: 10 pt.

3) Door numbers: 8 pt.

3. Functional Group Operation:
   a. Functional group operation provides a single touch point for all items related to a given door with activation by icons on the Menu Bar of the screen. Those items which are not related to a door (i.e. cameras, panic buttons) shall be accessed via individual icons in the display area of the screen when not the result of an alarm input.
   b. A functional group consists of those items that are related at a selected door location. The functional group will include, but not necessarily be limited to door control/monitoring, intercom(s), card reader(s), and keypad(s).
   c. Each functional group will be represented by a single touch point. When an event (i.e. call from an intercom, door alarm, reminder) is selected from the Activity List of the Menu Bar, the associated map shall be displayed and the selected functional group icon shall be automatically selected and highlighted. The touch point may be selected directly for use when not the result of selection from the Activity List of the Menu Bar.
      1) When the functional group has been selected automatically from the Activity List or manually by touching the touch point in the display area, the associated and applicable control icons in the menu bar shall be displayed.
      2) When activated by selection from the Activity List the calling intercom audio path shall be automatically activated. When activated directly by touching the functional group icon on a screen without selection from the Activity List, the audio paths for intercoms on both sides of the door shall be automatically activated.
      3) The camera icon shall not be a part of the functional group. Camera(s) associated with the functional group will display on the video monitor(s) upon selection of the functional group as described elsewhere in these specifications. Cameras shall be manually selectable by touching the camera icon on the screen.
4. Door Control Operations:
   a. The icon for door control/status shall be within the functional group icon for the associated door. The door shall be] indicated by a thick line or bar indicating the door position. The status icon for a door that is controlled on a given map shall be gray and graphically closed when the door is secure, red and graphically open when the door is unsecure, yellow when shunted, and flashing red when held unlocked. The status icon for a door that is monitored only on a given map shall be a round circle and shall be gray when secure, red when unsecure, yellow when shunted, and flashing red when held unlocked. Doors that are monitored only and indicate door status on monitor only screens shall be a round circle rather than a thick line or bar as described for the controlled door.
   b. Normal operation of detention swing door(s) or a manual sliding door(s) with electric/pneumatic locking device(s) shall be such that touching the associated UNLOCK icon shall initiate an unlock command. The locking device(s) shall be controlled to withdraw the lock bolt and hold bolt withdrawn for a preset period of time (set default at three seconds) and then released.
   c. Emergency release operation of detention swing door(s) or a manual sliding door(s) with an electric/pneumatic locking device shall be such that touching a HOLD UNLOCK icon shall initiate a hold unlock command. The locking device(s) shall be controlled to withdraw the lock bolt and hold withdrawn until the LOCK icon is touched or a global site, floor, or area emergency release mode reset is selected from Utility Screens. When emergency release of a group of doors is provided, the total group

select mode of operation time shall not exceed ten (10) seconds. Door hold unlock activities shall be logged to the RDBMS for reporting purposes.

d. Normal and emergency release operation of full operable electric/ pneumatic sliding devices shall be such that touching the OPEN icon associated with a door will cause the door to stop momentarily (if moving) and then open. Touching the STOP icon while the door is in movement shall cause the door to stop. Touching the CLOSE icon when the door is not secure shall cause the door to stop momentarily (if moving) and then close to a secure condition.

e. Selective group release and/or inmate access of cell doors and assign-unassign functions shall be displayed in a dialogue box via the GROUP CONTROL icon in the menu bar.
   1) Provide UNLOCK/OPEN icon in dialogue box for release of assigned doors. Assign/unassign functions shall be similar to that provided on the local control stations. When in the assign/unassign mode, a dialogue box shall be displayed to indicate the screen is not in an operational mode.
   2) Assign/unassign of individual doors shall be accomplished by touching the ASSIGN/UNASSIGN icon followed by touching the individual door to be assigned. The assign/unassign function shall stay active until a SAVE, CANCEL, or UNLOCK/OPEN icon is touched. The SAVE icon shall save the assignments, the CANCEL shall cancel the changes made in the session, and the UNLOCK/ OPEN icons shall save the assignments and unlock/open the assigned doors.

f. Emergency release of doors shall be displayed in a dialogue box via the EMERGENCY RELEASE icon in the menu bar.
   1) Upon confirmation in the dialogue box, all doors in the selected group to shall unlock and remain unlocked until the function is reset.
   2) Reset shall be via the dialogue box.
   3) Emergency release activities shall be logged to the RDBMS for reporting purposes.
   4) Monitoring/status of doors shall be displayed on all associated and applicable screens. Status indication shall be displayed on all screens regardless of task group assignment. The open contact position of the lock bolt switch or the door position switch shall indicate an unsecured status. The closed contact positions of the lock bolt switch and the door position switch shall indicate secure status.

g. A door prop alarm shall be provided for each electrically controlled door. Any door left non-secure after its assigned time period shall generate an alarm to the Activity List. A pre-recorded audio message shall be associated with the alarm at the time it is placed in the first line of the Activity List. Initially set each door to 30 second reference timer. The time period shall be adjustable by the administrator via the ADS/FS.
   1) Upon activation of a door prop alarm an alarm event shall be generated. A pre-recorded audio message shall be associated with the alarm at time of occurrence. Selection of the alarm from the Activity List shall display the location of the alarm and activate the ALARM icon in the Menu Bar. See description of ALARM icon for SILENCE/RESET functions.
   2) Door prop alarm activities shall be logged to the RDBMS for reporting purposes.
   3) Door prop alarms are not required for cell doors in housing units, except those in maximum security cells

h. An unauthorized access alarm shall be provided for each controlled or monitored door except where indicated on drawings. Any door that becomes non-secure without a command from the electronic security systems shall generate an alarm to the Activity

List. A pre-recorded audio message shall be associated with the alarm at time it is placed in the first line of the Activity List.

1) Upon activation of an unauthorized access alarm an alarm event shall be generated. A pre-recorded audio message shall be associated with the alarm at time of occurrence. Selection of the alarm from the Activity List shall display the location of the alarm and activate the ALARM icon in the Menu Bar. See description of ALARM icon for SILENCE/RESET functions.
2) Unauthorized access alarm activities shall be logged to the RDBMS for reporting purposes.
3) Unauthorized access alarms are not required for cell doors in housing units, except those in maximum security cells
4) Unauthorized access alarms shall be programmed with a delay to prevent false alarm from a door bounce effect.

i. A shunt function shall be provided for each door and alarm device (i.e. motion detector).
   1) Selection of a monitored door or security device followed by touching the SHUNT icon in the menu bar shall cause a dialogue box to be displayed. After confirmation the door prop, unauthorized access, or other alarm shall be ignored by the system.
   2) A shunt timer shall be provided for each device. Initially set to 15 minute reference timer. The time period shall be adjustable by the administrator via the ADS/FS. Upon expiration of the timer, a reminder alarm shall be generated to the Activity List. Selection of the activity shall display a reminder that the device has been shunted and provide icons for CONTINUE and RESET.
   3) Door shunt activities shall be logged to the RDBMS for reporting purposes.
j. An interlock override function shall be provided for each door that is part of one or more interlock groups. An interlock shall prevent more than one door of a group from being opened/unlocked electrically. An interlock override function shall provide the means to defeat the interlock and electrically open/unlock more than one door of an interlock group.
   1) An attempt to open a door that is part of an interlock group while another door of the interlock group is non-secure shall cause a dialogue box to be displayed indicating presence of an interlock. A pre-recorded audio message shall be associated with the dialogue box display.
   2) The dialogue box shall include icons for OVERRIDE or CANCEL. Touching the OVERRIDE icon shall defeat the interlock and unlock the previously selected door. Touching the CANCEL icon shall return to the floor plan screen maintaining the interlock.
   3) Interlock override activities shall be logged to the RDBMS for reporting purposes.
k. A function for enable/disable of card reader shall be provided for each door for which a card reader is provided. The control shall be part of the functional group. A status icon of a “CR” shall be displayed adjacent to the door. When the card reader is enabled on a door, the “CR” shall be yellow. When the card reader is disabled, the “CR” shall be gray.

5. Intercom and Paging Control Operations:
   a. The control of intercoms shall be within the functional group icon for the associated door. The status of the intercom shall be indicated by a speaker shaped icon at the intercom location. The status icon shall be gray when the intercom is inactive and

yellow when the intercom is active. Icon in active state shall be graphically different than in inactive state.

b. The status of paging function shall be indicated by a speaker shaped icon at the paging location. The status icon shall be gray when the paging is inactive, and yellow when the paging is active. Icon in active state shall be graphically different than in inactive state.

6. Auxiliary Control Operations:
   a. The icons for auxiliary control shall be available from the menu bar or utilities menu. The icons for auxiliary devices shall be graphical representations of the device controlled. The icon shall be gray when off and green when on.
   b. Control of devices of auxiliary systems such as lighting, receptacles, and other circuits shall be accomplished with icons assigned for such functions. Touching the icon shall alternately turn on/off the circuit. On/Off indication shall be driven by remote relay auxiliary contact activation. Off/On activation shall be capable of being placed on User defined time zones at the ADS/FS.
      1) Lighting control: Provide outputs to the electrical lighting control system for ON/OFF control of selected lighting circuits as indicated on drawings.
      2) Power control: Provide outputs to the electrical control system for control of electrical receptacles as indicated on drawings.
7. Access Control Operations:
   a. The control of an access control device (i.e. card reader) shall be via the functional group.
   b. Exit push buttons, where provided, shall remain activated when access control device is disabled except when disabled as a result of a duress or panic alarm. Exit push buttons shall emulate a call-in switch upon activation of area duress/panic alarm(s).
8. Duress Alarm Operations:
   a. The icons for duress alarms shall be displayed on the associated floor plan screen. The icon shall not be visible except when in the alarm condition. The icon shall be flashing red when active.
   b. Upon activation of a duress alarm device (i.e. panic button, duress alarm) an alarm event will be generated. A pre-recorded audio message shall be associated with the alarm at time of occurrence. Selection of the alarm from the Activity List shall display the location of the alarm and activate the ALARM icon in the Menu Bar. See description of ALARM icon for SILENCE/RESET functions.
   c. When a duress alarm is activated, local control functions shall be disabled (i.e. control stations, card readers), request to exit devices shall emulate call-in devices, and the audio channel shall open allowing audio monitoring of the area. Where video surveillance is provided for the affected area, the video image shall be displayed on the incident monitor. The video surveillance system shall be activated to select the camera in the affected area to begin recording.
9. Video Surveillance system:
   a. Icons for cameras shall be located on the graphic in their approximate location or in a location that will support the visual relationship for operation of a remote device (i.e. intercom, door). Touching the icon shall cause the video image to be displayed on the associated incident monitor.
10. Auxiliary System Alarms:
    a. Annunciation of fire alarms shall be provided as required to indicate area (smoke zone) of alarm. Red flashing fire symbol shall be located in room/area of associated alarm. Annunciation of alarms shall be secondary to the fire alarm system annunciation within the control room. Upon receipt of a fire alarm, an alarm event shall be generated in the queue. A pre-recorded audio message shall be associated

with the alarm at time of occurrence. Selection of the alarm from the queue shall display the location of the alarm and a dialogue box describing the alarm condition. The selection of the next item in the queue shall not be inhibited by this function. If the condition has not been changed within an assigned time period, the alarm shall recycle to the queue. The assigned time period shall be adjustable by the user via the ADS/FS.

b. Annunciation of UPS alarms shall be provided to indicate UPS on line and a summary alarm for other UPS manufacturer provided alarm functions. A pre-recorded audio message shall be associated with the alarm at time of occurrence.

c. Annunciation of electronic control system alarms shall be provided. A pre-recorded audio message shall be associated with the alarm at the time of occurrence.

F. Welcome Screen:

1. Provide Welcome screen with the visual image or perspective of the facility, the logo of the Owner/User, and the Project Name. The Electronic Systems Integrator logo may be included on the Welcome Screen (only). Provide icons for LOG ON, CLEAN SCREEN and TRAINING.
   a. Provide a Log On icon. Touching the LOG ON icon shall cause the Log on screen to be displayed. The Log on Screen shall be visual representation of a computer keyboard. The user shall be required to enter his/her User ID. A proper User ID shall display the visual image of a computer keyboard and request entry of a password. When password is being typed, asterisks shall appear instead of the actual text being typed to prevent viewing of password by others. Improper password shall generate a message indicating such. Successful entry of User ID and password shall cause the Main Screen to be displayed. Three unsuccessful log on attempts shall disable local touch screen stations where exposed to inmate activities.
   b. Provide a CLEAN SCREEN icon. Touching the CLEAN SCREEN icon shall cause a blank screen with the message CLEAN SCREEN to be displayed with a countdown timer. The countdown timer shall be adjustable from the ADS/FS and preset at 30 seconds. The last five (5) second shall flash a warning message, TIMER IS EXPIRING, STOP CLEANING AND DO NOT TOUCH. Upon expiration of the timer the previous screen will be displayed.
   c. Provide a TRAINING icon. Touching the TRAINING icon shall cause the Training Screen to be displayed. A user does not have to be logged into the system to access the training screens.
2. Welcome Screen shall be displayed on system boot-up. Access to Windows functions shall not be accessible from the touch screen at any time.
3. Provide screen saver consisting of the logo of the Owner/User. Activate only when operator is logged off the system. A text message shall inform operator to “touch screen”. Windows screen blanking shall be de-activated. Screen shall be displayed continuously then operator is logged on.
4. The logo of the Owner/User and visual image of the facility will be provided in *.jpg electronic format. Update will be provided periodically during the submittal and installation time up to completion. Insertion of updated files shall be made by the systems integrator at no cost to the Owner.

G. Main Screen:

1. Provide a Main Screen that is active when an operator is logged on the TS.
   a. For single level buildings, the Main screen shall include a building floor plan with icons for functional area selection.

b. For multi-level buildings, provide a perspective view of the building with icons for floor selection. Upon selection, display floor plan selected with icons for functional area selection.
c. When the project consists of multiple buildings on a site, the SITE PLAN shall display the buildings and provide touch points for each. Touch of a building touch point shall cause the security screen of the main/first floor plan of the building to be displayed.
d. Icons for area selection shall be gray when not assigned to station and green when assigned to station.

2. Provide the following icons in the display area of the Main Screen for LOG OFF and SITE PLAN.
a. Provide a LOG OFF icon on the Main Screen. Touching the LOG OFF icon shall cause a confirming dialogue box to be displayed providing a choice to LOG OFF, CHANGE USER, or CANCEL. Confirmation of LOG OFF shall log the operator out of the system and cause the Welcome Screen to be displayed and associated screen saver to be activated after preset time. At time of log off, task groups shall automatically transfer in accordance with assignment tables. Selection of CHANGE USER shall log the operator out of the system. User/Password screens to be displayed. (See Welcome Screen description above for log in procedure.) Activities shall continue to be received and held in the activity queue during the CHANGE USER process. Task Groups shall not transfer during this process. If a new user is not successfully logged on within 60 seconds, the function shall be canceled and tasks shall be transferred. Provide an on-screen timer to indicate countdown. Selection of CANCEL shall return to the Main Screen and resume operations.
b. Provide a SITE PLAN icon on the Main Screen. Touching the SITE PLAN icons shall display the site plan of the facility including icons, graphics and functions for cameras, intrusion detection systems, etc.

H. Menu Bar: Provide a Menu Bar at the bottom of each screen for operation of the touch screen. (Welcome Screen shall not have a Menu Bar.)
1. Provide an Activity List with a title line.
a. The title line shall include a column for each of: the time the activity was received, status (Acknowledged, Y or N), and activity description (minimum 40 characters). Non-acknowledged alarms shall be in red text, with acknowledged alarms shall be in yellow text.
b. The Activity List shall have a minimum of four lines displayed in the menu bar and an unlimited number of non-displayed lines for waiting activities.
c. The first (top) line of the Activity List shall display the activity that is selected and presently displayed. The first line shall be highlighted using a color background.
d. The activity in the second line of the Activity List shall be pre-selected and visually highlighted for selection by the SELECT icon.
e. Incoming activities shall be placed in the Activity List based on their assigned priority. Higher priority alarms shall be inserted above lower priority alarms. Activities of a common priority shall be arranged in first-in-first-out sequence. Activities of priority levels one two and three shall be linked with an audible alarm which shall sound upon receipt of the alarm (not wait for selection).
2. Provide a SELECT icon that when touched will activate the selected activity from the second line of the Activity List, causing movement to the map associated with the selected activity and activation of the functional group or alarming device.
3. Provide an IC RESET icon for reset of an intercom station. Touching IC RESET icon shall turn off the selected intercom station. Movement to a new map shall automatically turn off the selected intercom station.

4. Provide an UNLOCK/OPEN icon.
   a. The UNLOCK text shall display when a swing door or manual (kick-release) slider has been selected. Touching the UNLOCK icon shall cause the selected swing door to unlock or the selected manual (kick-release) slider to open.
   b. The OPEN text shall display when a fully operational slider has been selected. Touching the OPEN icon shall cause the selected sliding door to open to its full open position unless the STOP or CLOSE icon is touched.
   c. The space on the menu bar that was allocated for the icon shall be blank (no text) when no door is selected.
5. Provide a HOLD UNLOCK/STOP icon.
   a. The HOLD UNLOCK text shall display when a swing door or manual (kick-release) slider has been selected. Touching the HOLD UNLOCK icon shall cause a dialogue box to be displayed. When the dialogue box confirmation is made it shall cause the selected swing door or the selected manual (kick-release) slider to unlock/open and be electrically held unlocked/open. Door alarms shall be disabled when door is HOLD UNLOCK position.
   b. The STOP text shall display when a fully operational slider is selected.
   c. Each controlled door shall be provided with a reminder alarm when placed in the HOLD UNLOCK. A reminder that the door has been held unlocked shall be generated periodically based on the referenced timer assigned for the hold unlock function. Timer setting shall be initially set at 15 minutes. When the reminder timer has expired, an activity shall be generated and displayed in the Activity List. Selection of the activity shall cause a dialogue box to display with icons to CONTINUE, RESET, or HELP.
      1) Selecting the CONTINUE icon shall continue the HOLD UNLOCK function and reinitiate the timer.
      2) Selecting the RESET icon shall release the HOLD UNLOCK function, allowing the door to be locked.
      3) Selecting the HELP icon shall cause the HELP: HOLD UNLOCK dialogue box to be displayed.
   d. The space on the menu bar that was allocated for the icon shall be blank (no text) when no door is selected.
6. Provide a CLOSE icon. The CLOSE text shall display when a fully operational slider or a manual (kick release) slider is selected.
   a. The CLOSE function for the fully operational slider shall cause the door to close until locked.
   b. The CLOSE function for a manual (kick release) slider shall release the door from its locked open position, allowing the door to be manually closed. When manual slider is standard configuration (without the locked open (NLO) position), the CLOSE function is not required nor displayed.
   c. The space on the menu bar that was allocated for the icon shall be blank (no text) when no door is selected.
7. Provide an ACTIVITY LIST icon for display of the entire Activity List. Such list shall be displayed in a pop-up window with an UP/DOWN (scroll), SELECT, CLEAR ALL, and CANCEL icon. The activity selected shall be highlighted using a color background. SELECT shall cause the highlighted line to be activated, pop-up window to be canceled, the activity placed in the selected line of the activity area, causing movement to the map associated with the selected activity and activation of the functional group or alarming

device. CLEAR ALL shall cause a confirming dialogue box to be displayed. Upon confirmation, all activities in the queue shall be cleared.

8. Provide an ALARM icon. The ALARM text shall be displayed when an alarm activity is selected (i.e. duress pushbutton, unauthorized access, door prop, motion detector, intrusion detection alarm).
    a. Touching the ALARM icon shall cause a dialogue box to be displayed indicating the type of alarm, current status and icons for SILENCE, RESET, and HELP.
        1) When SILENCE is selected it shall cause the audible alarm to be silenced and the activity to be placed in the Activity List as an acknowledged alarm. Upon activation of the SILENCE function, an adjustable reminder timer (initially set at 15 minutes) will start. Upon expiration of the timer, a reminder alarm shall be generated and displayed in the Activity List.
        2) Selecting the RESET icon shall cause the alarm to be reset. If the local alarming device remains in alarm condition, a dialogue box shall be displayed indicating that “the local alarming device has not been physically reset and cannot be reset at this time.” In such a case the activity will remain as an acknowledged alarm with periodic reminders until alarm is reset.
        3) Selecting the HELP icon shall cause the HELP: ALARM dialogue box shall be displayed.
    b. The space on the menu bar that was allocated for the ALARM icon shall be blank (no text) when no alarmed device has been selected.
9. Provide a SHUNT icon. The SHUNT text shall be displayed when an alarming device (i.e. door, motion detector, intrusion detection alarm) has been selected.
    a. Each alarming device shall be capable of having its alarm functions shunted. When an alarm is shunted the alarm shall be ignored.
    b. Selecting the SHUNT icon shall cause a dialogue box to be displayed indicating current status and icons for SHUNT, CANCEL, and HELP.
        1) Selecting the SHUNT icon shall cause the alarm for the selected device to be shunted.
        2) Selecting the CANCEL icon shall close the dialogue box and return to the screen.
        3) Selecting the HELP icon shall cause the HELP: ALARM SHUNT dialogue box to be displayed
    c. Each alarming device shall be provided with a reminder alarm when placed in SHUNT. A reminder that the alarming device has been shunted shall be generated periodically based on the referenced timer assigned for the shunt function. Initially set to 15 minute reference timer. When the reminder timer has expired, an activity shall be generated and displayed in the Activity List. Selection of the activity shall cause a dialogue box to display with icons to CONTINUE, RESET, or HELP.
        1) Selecting the CONTINUE icon shall continue the SHUNT function and reinitiate the timer.
        2) Selecting the RESET icon shall release the SHUNT function, allowing the alarming device to be active.
        3) Selecting the HELP icon shall cause the HELP: ALARM SHUNT dialogue box to be displayed.
    d. The space on the menu bar that was allocated for the SHUNT icon shall be blank (no text) when no alarming device is selected.
10. Provide a CARD READER icon. The CARD READER text shall be displayed when a door provided with a CARD READER function has been selected.
    a. Touching the CARD READER icon shall cause a dialogue box to be displayed indicating current status and icons for DISABLE/ ENABLE, CANCEL, or HELP.

1) Selecting the DISABLE icon shall cause the CARD READER function to be disabled. Selecting the ENABLE icon shall cause the CARD READER function to be enabled.
2) Selecting the CANCEL icon shall close the dialogue box and return to the screen.
3) Selecting the HELP icon shall cause the HELP: CARD READER dialogue box to be displayed

b. The space on the menu bar that was allocated for the CARD READER icon shall be blank (no text) when no door with CARD READER function is selected.

11. Provide a GROUP CONTROL icon. The GROUP CONTROL text shall be displayed when a housing area screen with groups of cells is displayed.
    a. Touching the GROUP CONTROL icon shall cause a dialogue box to be displayed with icons for assignment of cells to groups and release of groups of doors. Icons shall be provided for each cell door. Touching each icon shall alternately select/deselect the door from a group. Icons shall be provided for ASSIGN/UNASSIGN ALL, SAVE, UNLOCK/OPEN, CLOSE, CANCEL, and HELP.
        1) Selecting the ASSIGN/UNASSIGN ALL icon shall alternately assign or unassign all cells to the group.
        2) Selecting the SAVE icon shall save the current settings.
        3) Selecting the UNLOCK/OPEN icon shall unlock/open all cell doors assigned to the group.
        4) Selecting the CLOSE icon shall close all fully operational cell sliding doors and release all manually operated sliding cell doors assigned to the group.
        5) Selecting the CANCEL icon shall close the dialogue box and return to the screen.
        6) Selecting the HELP icon shall cause the HELP: GROUP CONTROL dialogue box to be displayed
    b. The space on the menu bar that was allocated for the GROUP CONTROL icon shall be blank (no text) when a screen other than those for housing areas with groups of cells is displayed.
12. Provide an AUXILIARY CONTROL icon. The AUXILIARY CONTROL text shall be displayed when a screen depicts an area with auxiliary controls (i.e. lighting, power).
    a. Touching the AUXILIARY CONTROL icon shall cause a dialogue box to be displayed with icons for each controlled device. Touching each icon shall alternately turn on/off the device. Icons shall be provided for CANCEL and HELP.
        1) Selecting the CANCEL icon shall close the dialogue box and return to the screen.
        2) Selecting the HELP icon shall cause the HELP: AUXILIARY CONTROL dialogue box to be displayed
    b. The space on the menu bar that was allocated for the AUXILIARY CONTROL icon shall be blank (no text) when not on a screen where auxiliary controls are provided.
13. Provide an EMERGENCY RELEASE icon. The EMERGENCY RELEASE text shall be displayed when a housing area screen with groups of cells is displayed.
    a. Touching the EMERGENCY RELEASE icon shall cause a dialogue box to be displayed with icons for emergency release of groups of doors.
    b. Each emergency release group shall be provided with a reminder alarm when placed in EMERGENCY RELEASE. A reminder that the group has been held placed in emergency release shall be generated periodically based on the referenced timer assigned for the hold unlock function. Timer setting shall be initially set at 15 minutes. When the reminder timer has expired, an activity shall be generated and displayed in the Activity List. Selection of the activity shall cause a dialogue box to display with icons to CONTINUE, RESET, or HELP.

1) Selecting the CONTINUE icon shall continue the EMERGENCY RELEASE function and reinitiate the timer.
2) Selecting the RESET icon shall release the EMERGENCY RELEASE function, causing swing door lock bolts to be released, fully operational sliding cell doors to close, and manually operated sliding doors to be released, allowing the doors to be closed/locked.
3) Selecting the HELP icon shall cause the HELP: EMERGENCY RELEASE dialogue box to be displayed.

c. The space on the menu bar that was allocated for the EMERGENCY RELEASE icon shall be blank (no text) when a screen other than those for housing areas with groups of cells is displayed.
d. Activation of EMERGENCY RELEASE shall disable door prop alarms

14. Provide a UTILITY icon. The UTILITY icon shall be displayed on all screens except the Welcome Screen. Touching the UTILITY icon shall cause the Utilities Screen to be displayed. (Utility Screen is described later in these specifications).
15. Provide a MAIN icon. The MAIN icon and text shall be displayed on all screens except the Welcome and Main Screen. Touching the MAIN icon shall cause the Main Screen to be displayed.
16. Provide a SCREEN icon with back and forward graphic arrows. The SCREEN icon shall be displayed on all screens except the Welcome Screen. Touching the back arrow icon shall cause the previous screen to be displayed. The system shall provide the ability to go back a minimum of six (6) previous screens. Touching the forward arrow shall allow return to the original screen in reverse order from which the back arrow sequence began.
17. Provide icons for moving UP and DOWN between floors when facility includes multiple floors. Where no floors exist to move to from the presently displayed screen, the associated icon shall be blank.

I. Utility Screen

1. Provide list of all utility functions associated with facility operations for operator selection, including, but not necessarily limited to the following.
   a. Functional Area assignment screen: Assign functional areas to task groups using matrix display.
      1) List functional areas vertically on the left side and task groups horizontally along the top
      2) Provide icons in matrix to assign each functional area to a task group
      3) Provide separate screen for each of four time periods
      4) Provide DEFAULT icon on each screen for selection of default assignments
      5) Provide icons for SAVE and CANCEL
      6) Access limited to Supervisor level and above
   b. Task Group assignment screen: Assign task groups to touch screen stations.
      1) List task groups vertically on the left side and touch screen station horizontally along the top.
      2) Provide icons in matrix to assign each task group to a touch screen station in the priority to be assigned. Priority 1 shall be the first station the task group is to be assigned to. If that station is inactive, the task group shall be assigned to the touch screen designated as priority 2, and so on to the number of touch screen stations provided (plus future stations as indicated).
      3) Provide separate screen for each of four time periods.
      4) Provide DEFAULT icon on each screen for selection of default assignments for present time period. Selection of default on task group assignment screen shall also select defaults on the functional area assignment screen.

5) Provide icons for SAVE and CANCEL. Selecting the SAVE icon shall save the selected assignments.
6) Access limited to Supervisor level and above.

c. Functional Area Assigned screen: display list or graphic of functional areas under control of the touch screen making the query.
d. Control Transfer: display the status of each control location and provide capability for transfer of control.
e. Operator level assignment screen: display list of each function and the operator level required to perform function independently.
f. Card Reader screen: Provide a screen with icons representing each functional area of the building(s) to allow card reader and keypad enable/disable by pre-assigned group, area, floor, and site.
g. Calibration Screen: Provide means to calibrate the screen for the operator using the features of the MMI/GUI software.
h. Configure Users: (Administrative User only) Provide means to add and delete Users and set User Names and User Passwords. Access limited to Manager and above
i. Help screen: Provide list of available help dialogue boxes.
j. Clean Screen: Provide access to clean screen function described previously.
k. Provide icons to return to Utility Screen or Main Screen on each screen under the Utility Screen.

J. Help Screen:
1. Provide list of help screens and dialogue boxes associated with the Presentation and Display System for operator selection, including, but not necessarily limited to the following.
a. Controlled door operations
b. Door Prop alarms
c. Unauthorized access alarms
d. Card Reader operations
e. Group control operations
f. Emergency release operations
g. Alarm shunt
h. Interlock override
i. Queue and Activity List
j. Intercom
k. Paging
l. Auxiliary controls
m. Configure Users
n. Functional Area Assignment
o. Task Group Assignment
p. Control Transfer
q. Supervisor override functions
r. Utilities
s. Others as needed and defined in submittals
2. Provide scrolling UP/DOWN, SELECT and CANCEL icons.

K. Building Screens
1. Screens shall be developed to display all areas of the facility. Plans shall be scaled to fit the available monitor screen. Screens shall include but not be limited to the following.
a. An overall site and building(s) plan for selection of individual building, area or site.

b. An overall site plan with icons to include gate control, monitoring, camera locations, intrusion detection, etc.
c. An overall floor plan of each floor/level of each building of the facility
d. A floor plan of each functional building area such as housing, jail support, services, administration, etc.
e. Screens for housing areas with mezzanine cells shall position the mezzanine as a projection from the main level rather than separate screens or plans.
f. Each functional area within a building area including but not limited to the following:
    1) Public entry(s)
    2) Visitation area(s)
    3) Transportation
    4) Booking/Intake
    5) Service/Delivery
    6) Vehicle sally port(s)
    7) Maintenance
    8) Housing area(s)
    9) Support area(s)
    10) Administration area(s)
g. Screens for functional areas shall be displayed at a scale that will minimize the quantity of maps and display as much of the functional area as possible on a single map while maintaining sufficient spacing of touch points to prevent accidental selection of improper icon. Multiple screens may be required for each functional area
h. Separation of screens shall generally occur at traffic locations within the complex such as sally ports. At these locations the status of all related devices shall be indicated, while the control of functional groups within these areas shall be assigned to the adjacent areas that are to be entered.
i. Additional screens may be required to zoom in to selected areas due to scaling factors.
j. Movement icons shall be provided on building screens to allow movement to all adjacent areas. Movement icons shall consist of an arrow indicating the direction of movement and text describing the adjacent screen.

2. Each area of the building shall be provided a screen for full control/monitor and a separate screen for monitor only. The touch screen station assigned the functional area shall be provided with the full control/monitor screens. Other touch screen stations (not assigned the functional area) shall be provided with the monitor only screens. Screens for monitor only shall include the status of all doors, card readers. Monitor only screens shall include icons to allow selection of cameras associated with the screen. The status display of doors for monitor only screens shall be a round indicator as specified for a door that is monitored only. See Task Management.

L. Special Function Screens:
1. Screens shall be developed for special functions include emergency life safety functions and security functions.
    a. Life Safety Screens shall be developed for life safety systems and emergency egress operations. Smoke zones and paths of egress shall be identified on a series of screens.
        1) An overall floor plan of each floor/level of each building of the facility
        2) A floor plan of each functional building area such as housing, jail support, services, administration, etc.
        3) Fire alarms shall be displayed by smoke zone and access to emergency egress door control shall be provided on the associated screen.

4) Stairs shall be shaded and a different color to allow recognition of vertical movement when they are a designated egress path.
5) Each screen shall indicate the status of all monitored doors of the area displayed.
6) Egress paths shall be indicated by graphic flowing arrows. Egress paths shall be determined from the Architect's life safety plans.
7) An overlay of the active floor plan maps indicating the above information may be used for these screens.

M. Task Management:
1. A task management system shall be provided to allow distribution of workload among all TS stations "on-the-fly". Assignment of tasks to TS shall be available at each TS and the ADS/FS. Default configurations shall be available from the ADS/FS only.
2. Each task shall be assignable to any station at any given time via a Task Assignment screen.
3. Prior to a TS being idled, another TS(s) must capture all task groups that are assigned to the station to be idled and shall be transferred to their next priority station in accordance with the task group assignment screen. All activities in queue Activity List of the station to be idled shall be transferred to the selected station(s) at time of transfer.

N. Dialogue Boxes:
1. Dialogue boxes shall be pop-up windows that are activated in order to provide information to the operator and allow confirmation of action or direct alternative actions.
2. Each controlled device shall be provided with an associated informational dialogue box and help dialogue box that shall contain information concerning the device or function selected. Provide all necessary development time with User's representative and Engineer after User Initial Review for development and recording text to be provided in dialogue boxes.
3. Dialogue boxes shall contain icons for movement to other functions as well as return to previous function.
4. Dialogue boxes shall be provided for, but not necessarily limited to the following functions.
   a. Control station enable/disable
   b. Interlock override
   c. Alarm shunt
   d. Unauthorized access
   e. Card reader control
   f. Group door operations
   g. Emergency release and reset
   h. Group assign/unassign
   i. Alarm silence/reset.
   j. Auxiliary controls
   k. Interior security doors
   l. Exterior perimeter security doors
   m. Interior sallyport doors
   n. Exterior perimeter sallyport doors
   o. Duress Alarms
   p. Fire alarm
   q. Hold Unlock
   r. Door Prop Alarm
   s. UPS Alarm

2.4 REPORT GENERATION

A. Provide report generation capabilities from the ADS/FS for all system administration, inmate management, employee data, and security system maintenance.

B. All data logging information shall be stored in the RDBMS.
   1. Provide data reporting program to generate activity reports based on user selectable search criteria.
   2. Provide for creation of custom reports to retrieve data from the database.

C. Selected events shall be logged and archived on the FS for use in report generation from all devices connected to the electronic security control systems. Logging shall be for each application and each change in status. Provide means to print to logging printer at user selection for each alarm type. Include the following items for archival and optional printing.
   1. Log on Successful, Log on unsuccessful, Log off
   2. Duress alarm activation, Duress alarm reset
   3. Door unauthorized access, unauthorized access reset
   4. Door ajar, Door ajar reset
   5. Door unlock, open, close, hold unlock
   6. Interlock override, Interlock override reset
   7. Emergency release
   8. Fire alarm, Fire alarm reset
   9. Panic button activation, Panic button local reset, Panic button TS reset
   10. Cabinet tamper alarms
   11. ECS alarms
   12. UPS alarms
   13. Network alarms
   14. Task Group reassignment (local, automatic and administrative)
   15. Access Control System alarms
   16. Motion detection, Motion detector reset

D. Report Generation: Provide access to the RDBMS to allow generation and printing of reports based on user requests and queries.
   1. Employee Log Report:
      a. Purpose: To query, display and print activity of each employee consisting of time logged in and/or out at each station or device.
      b. Query options: Create report based on user entry of the following.
         1) Employee identification: Individual, All (default). Sort all reports by time. When by All is selected, sort alphabetically.
         2) Time (by minute) and Date: Time default shall be 12:00:00am to 11:59:59pm. Date default shall be present date.
   2. Door Activity Report:
      a. Purpose: To query, display and print activity at each door in the facility.
      b. Query options: Create report based on user entry of the following.
         1) Door identification: Individual, Area, All (default). Sort all reports by time. When by Area is selected, sort by door. When by All is selected, sort by Area by door.
         2) Time (by minute) and Date: Time default shall be 12:00:00am to 11:59:59pm. Date default shall be present date.
   3. Security System Report:
      a. Purpose: Provide reports on security equipment and operations.
         1) Device Number: Alpha-numeric, 8 characters, changeable
         2) Device type: Alpha-numeric, 8 characters, changeable

3) Installation Date: Alpha-numeric, 8 characters, changeable. (Initial installation date shall be set to date of project warranty initiation)
4) Operations since installation: Alpha-numeric, 16 characters, system generated
5) Date of Last Maintenance: Alpha-numeric, 8 characters, changed by input to device report
6) Operations since last maintenance: Alpha-numeric, 16 characters, system generated

b. Query options: Create report based on user entry of the following.
1) Device: Individual, Area, All (default). When Area is selected, sort by number, When All is selected, sort by area by number.
2) Time (by minute) and Date: Time default shall be 12:00:00am to 11:59:59pm. Date default shall be present date.

4. Security System Alarm Report:
a. Purpose: To query, display and print alarm activity on security system.
b. Query options: Create report based on user entry of the following. Sort all reports by time.
1) Alarm Type: Individual, All (default). Sort all reports by time. When All is selected, sort by alarm type.
2) Time (by minute) and Date: Time default shall be 12:00:00am to 11:59:59pm. Date default shall be present date.

5. Interlock Override Report:
a. Purpose: To query, display and print all instances when interlocks were overridden.
b. Query options: Create report based on user entry of the following. Sort all reports by time.
1) Building Area: Housing, Administration, Program, All (default). When All is selected, sort by area.
2) Time (by minute) and Date: Time default shall be 12:00:00am to 11:59:59pm. Date default shall be present date.
3) List Station, door, operator, and date/time.

6. Door Alarm (Unauthorized Access, Door Ajar) Report:
a. Purpose: To query, display and print all door operations not generated by a control system input.
b. Query options: Create report based on user entry of the following. Sort all reports by time.
1) Building Area: Housing, Administration, Program, All (default). When All is selected, sort by area.
2) Time (by minute) and Date: Time default shall be 12:00:00am to 11:59:59pm. Date default shall be present date.
3) List door, control station, and date/time.

7. Provide sufficient disk storage to accommodate 90 days of activity for all reports. Provide message on ADS/FS at end of each month suggesting database archival to back-up media. Provide warning message on ADS/FS and at each TS after 75 days if no back-up has been created. Warning message shall repeat every 24 hours until back-up is accomplished. Provide user friendly, menu driven back-up sequence.

PART 3 - EXECUTION

3.1 INSTALLATION (SEE SECTION 280510)

3.2 WIRING (SEE SECTION 280510)

3.3 TESTING (SEE SECTION 280510)

A. Task group management capabilities shall be tested and demonstrated to ensure separation of control, audio, video, etc.

B. Test and demonstration shall include assignment of a single task group to a single station one at a time in order to confirm isolation from all other task groups.

3.4 TECHNICAL SUPPORT

A. Programming Updates:
   1. The Electronic Systems Integrator shall provide a minimum of twenty-four (24) hours of on-site programming changes to the touch screen displays to accommodate User requests after substantial completion. Programming changes shall be made by the original programmer or a qualified programmer familiar with the programming of the project. Provide supplementary programming for related systems as needed to support the changes in the touch screen displays

B. Technical Support:
   1. Provide on-site programming and unlimited technical support during business hours for the duration of the warranty period (1 year from final acceptance) via a toll free telephone line.
      a. Touch Screen software programming: 24 hours
      b. Programmable logic controller programming: 16 hours
      c. Related integrated systems programming (i.e. intercom, video): 16 hours
   2. Provide a three ring binder with technical information, settings, and maintenance log for each system CPU. Provide diagnostic configuration reports on each system. Maintain and update this information throughout the warranty period.
   3. Provide the ability to connect through a modem the security automation system from the integrator's office. The connections shall be connected manually by the authorized using agency representative. The purpose is to provide remote diagnostics of the overall system, download updated programs and to aid in troubleshoot of doors adjustment problems among other services.

3.5 OWNER PERSONNEL TRAINING (SEE SECTION 280510)

A. Provide training of owner personnel in proper operation and maintenance of touch screen control and management system.

B. Training Outline-Operational staff:
   1. Log ON/OF procedures
   2. All Utilities Functions
   3. Task Group Management
   4. Screen movement and navigation

5. Acknowledgment/Responses
6. Control Functions
7. Emergency Operations

C. Training Outline-Administrative:
1. Review of each software package including diagnostic capabilities
2. Database manipulation, settings and defaults
3. Task Group Management
4. Back-up and Restoration
5. Report Generation
6. Emergency Procedures

D. Training Outline-Maintenance Staff:
1. Systems Operation
2. Component Review
3. Routine Maintenance/Adjustments
4. Hardware replacement, diagnostics, etc
5. Expansion Capabilities

END OF SECTION

SECTION 285045

UNINTERRUPTIBLE POWER SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. General:
1. Furnish all labor, materials, tools, equipment, and service for all uninterruptible power supply (UPS) system as indicated in accordance with provisions of Contract Documents.
2. Completely coordinate work with other trades,
3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
4. See Division 1 for General Requirements

B. Related work specified elsewhere:

A. Electronic Security Systems:

1.	Cabinets and Enclosures:	Section 28 0555
2.	Access Control System:	Section 28 1300
3.	Video Management and Recording System	Section 28 2300
4.	Electronic Control System:	Section 28 4619
5.	Touch Screen Control and Management System:	Section 28 4623
6.	Digital Intercom and Paging System:	Section 28 5123

1.2 QUALITY ASSURANCE (SEE SECTION 280510)

1.3 SUBMITTALS (SEE SECTION 280510)

A. Uninterruptible Power Systems:
1. Project data: Description of system operation indicating purpose and capabilities of each component of system with functional system diagram indicating all interfaces to other systems. Description shall include, and call attention to, all variances from the contract documents.
2. Shop drawings: Complete installation drawings including system diagrams and terminal point to terminal point wiring diagrams or schedules.
3. Project data: System and battery sizing calculations.

1.4 WARRANTY (SEE SECTION 280510)

A. The complete system, (batteries and UPS system) shall be furnished and guaranteed by the same manufacturer.

B. Provide one year manufacturer’s warranty.

1.5 OPERATING AND MAINTENANCE DATA (SEE SECTION 280510)

PART 2 - PRODUCTS

2.1 GENERAL

A. Acceptable Manufacturers:
   1. Uninterruptible Power Systems
      a. Base: EATON 9355 , American Power Conversion (APC), Liebert; Control Power.
   2. Other manufactures desiring approval comply with Division 1
   3. UPS to be Three Phase for this project.

B. Provide uninterruptible power for back-up of all control and monitoring systems except electro-mechanical locks, and electrically operated gates or overhead doors.

C. Each UPS system shall independently receive its power supply directly from the main/emergency power supply of the facility.

D. Each UPS system shall be provided with an alarm panel for indication of individual system alarms. On Battery and Summary alarms shall be remotely monitored by the access control and management system.

E. Each UPS system shall be sized for a minimum of twenty (20) minutes of stand-by power under full connected load.

F. Each UPS shall have input and output voltages as indicated on drawings or specified herein. Refer to Div. 26 panel schedules and coordinate with Div. 26 for UPS requirements.

G. The secondary circuit of each UPS unit shall be provided with a Transient Surge Protection device as specified herein, located downstream of the bypass switch.

H. Each floor mounted UPS shall be provided with the cabinet that is expandable from 8 to 12 slots (capacity up to 20KVA).

2.2 UNINTERRUPTIBLE POWER SYSTEM (UPS)

A. The UPS shall enable customers to build a power solution specific to their needs, with an expandable level of redundancy and increased runtimes through modular, plug-and-play 4 kVA UPS and battery modules. The UPS shall be able to be configured to eight- or twelve-slot enclosures and shall be available for tower and rackmount applications.

B. Uninterruptible power systems shall provide active regulation of input voltage and standby battery power in the event of power loss or degeneration below acceptable limits.

C. The UPS shall feature the ability to switch from Normal Online to High Efficiency mode.

D. UPS shall house both logic and power in the power module and shall offer a single-cabinet design.

E. Upon loss or degeneration of input power the system shall instantaneously transfer to the inverter and standby battery source. Retransfer to normal power shall occur upon return of input power within acceptable limits.

F. In the event of an inverter malfunction the system shall instantaneously switch to the incoming AC line. The inverter shall shut down and drive an alarm when the input voltage drops below 95 volts DC.

G. Provide Relay Alarm Module for each UPS.
   1. Provide alarms to the PLC for:
      a. Battery Fault (Warns to check UPS for battery faults)
      b. Low Battery (Warns that batteries are low and may shut down partial system)
      c. Load On Battery (Warns that the power switched to UPS)
      d. UPS Offline (Alarm on loss of “UPS Online” status – Warns the UPS is offline)
   2. Eaton Relaycard-MS or equal

H. The UPS and associated battery cabinet shall be free standing unless noted otherwise. Provide wheel casters on all floor mounted units. Where indicated the UPS and associated battery cabinet shall be rack mounted.

I. Provide external, wall mounted Make-Before-Break manual bypass switch for each floor mount UPS unit. Provide rackmount Make-Before-Break bypass switch for rackmounted UPS units.

J. UPS units shall be provided with integral keypad and digital display for system diagnostics. Where integral keypad and display is not available, provide hand held remote keypad.

2.3 SCHEDULE

UPS	VOLT AMPS KVA	MOUNT/ROOM
9355	20	Room #164FLOOR

PART 3 - EXECUTION

3.1 INSTALLATION (SEE SECTION 280510)

A. Follow all written instructions provided with the equipment and.

B. Coordinate location of UPS, Battery Unit, load distribution panels(s), and MBB switch within equipment rooms. Maintain NEC required working clearances.

C. Provide grounding per NEC

3.2 TESTING (SEE SECTION 280510)

A. UPS system shall be tested as a part of the Demonstration Upon Completion of Work to confirm the duration of time from activation until low battery alarm, and from low battery alarm to system drop out.

B. All security system equipment shall be turned on during the test.

C. Provide instrumentation including strip chart to illustrate the connected load reduction over time

3.3 WIRING (SEE SECTION 280510)

3.4 OWNER PERSONAL TRAINING (SEE SECTION 280510)

END OF SECTION

SECTION 285123

DIGITAL INTERCOM AND PAGING SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. General:
   1. Furnish all labor, materials, tools, equipment, and services for digital intercom and paging system as indicated in accord with provisions of Contract Documents.
   2. Completely coordinate with work of all other trades.
   3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
   4. See Division 1 for General Requirements.

B. Related work specified elsewhere:
   1. Common Work Results for Electronic Security: Section 2805 10
   2. Cabinets and Enclosures: Section 2805 55
   3. Digital Video Management System: Section 2823 00
   4. Electronic Control System: Section 2846 19
   5. Touch Screen Control and Management System: Section 2846 23
   6. UPS Section 285045

1.2 BASIS OF DESIGN

A. The electronic security systems described within the specifications and drawings shall function as an integrated system. The control and monitoring stations shall function as a single control point, appearing to function as a single system. Although the system is made up of several sub-systems, they shall be integrated in both physical and electronic manner to achieve a single system presentation to the operator.

B. The project will include multiple intercom communication controllers configured in a network that will allow switching of system audio buses to a higher level control location when the local control station is disabled. All control location shall be provided with the intercom communication station and master intercom station. The communication will be networked together for data and audio communication purposes. Data exchange will be developed to provide functionality and integrated operation with electronic control system, touch screen control stations and the video management and recording systems.

C. The purpose of the intercom and paging system is to provide fast “duplex,” voice master-to-master communication and half duplex master-to-intercom station communications. The system shall be configured to provide instant intercommunications between any stations in the system.

D. Master-to-master communications is to be provided with programming capability to restrict access, conference, preset call groups and caller ID. Master stations shall use telephone sets with digital displays capable of being mounted on wall or desk.

E. Intercom stations shall be provided in each single cell, on each side of remotely controlled doors and similar areas as indicated on the drawings. Paging of the dayroom is provided from any touch screen control station or master station.

F. The project includes multiple intercom communication controllers configured in a network that will allow switching of system audio buses to a higher level control location when the local control station is disabled.
   1. The communication controllers shall be networked together for data and audio communication purposes. Data exchange shall be developed to provide functionality and integrated operation with electronic control system, digital controllers, touch screen control stations and the video surveillance systems
   2. Desk mounted master stations and speaker/ microphone units shall be located at control stations and touch screen control stations for audio communications.
   3. The digital communication controllers shall be located in the designated security equipment rooms.

G. When a local control station is disabled by, panic/duress activation or by a touch screen control station, all local calls shall be transferred to a pre-selected touch screen control station. Pre-selection shall be provided via the task group management functions of the touch screen control system. Upon such action, calls from devices in the local area shall be routed to the pre-selected touch screen control station.

H. Intercom stations shall be provided in each sleeping room and generally on each side of remotely controlled doors. Other locations may be required as shown on drawings.

I. Call-in pushbutton switches are used where call-in is desired, but not audio communications.

J. Intercom devices in some locations are to be mounted in the door frame, due to lack of sufficient space in adjacent walls. Coordinate with Detention Equipment Contractor for installation of devices in frames.

K. A communication interface will be provided at each control station to allow intercom and paging functions to occur.

L. The project includes configuration in a manner that will allow switching of system audio buses to a higher level control location when the local control station is disabled.
   1. An audio switching network shall be provided in order to allow transfer of the audio bus from the local control location to higher level control.
   2. When a control station is disabled by a duress alarm or touch screen station, the audio of the local control shall be connected to the designated higher level control station. Upon disable of the local control station, calls from devices in the local area shall be routed to the designated higher level control station.

M. At touch screen stations, cameras that are associated with intercom stations, acknowledgement of a call will cause the associated camera to be displayed.

N. Paging systems
   1. Paging is provided at the local housing unit for the purpose of general announcements to occupants and monitoring of ambient noise levels.
      a. Paging horns are provided in the outdoor recreation areas associated with the housing units.
      b. Ceiling mounted paging speakers are provided in the housing units.

2. The paging system is a zoned system with all call options as listed in Schedule B at the end of this section

1.3 QUALITY ASSURANCE (SEE SECTION 280510)

1.4 SUBMITTALS (SEE SECTION 280510)

A. Digital Intercom and Paging System:
   1. Project data: Description of system operation indicating purpose and capabilities of each component of system with functional system diagram indicating interfaces to all other systems. Description shall include, and call attention to, all variances from the contract documents.
   2. Shop drawings: Complete installation drawings including system diagrams and terminal point to terminal point wiring diagrams or schedules.
   3. Product data: Technical data sheets and specifications for each and every component.
   4. Calculations: Amplifier sizing

1.5 WARRANTY (SEE SECTION 280510)

1.6 OPERATING AND MAINTENANCE DATA (SEE SECTION 280510)

PART 2 - PRODUCTS

2.1 GENERAL

A. Acceptable manufacturers: All systems by same manufacturer, having authorized installer and service organization.
   1. Communication system:
      a. Base:
         1) Harding Instruments Co. Ltd. Microcomm DXL
      b. Optional:
         1) Stentofon
         2) Commend
   2. Other manufacturers desiring approval comply with Division 01 Requirements.

2.2 SYSTEM DESCRIPTION

A. The system shall consist of a microprocessor controlled, fully "digital", PC programmable, network of switching digital communication controllers with redundant controlling computers.

B. The system shall include all features and functions required for a fully operational integrated system. System shall be capable of adding optional features, equipment and interfaces.

2.3 SYSTEM DESCRIPTION

A. The system shall consist of a microprocessor controlled, fully "digital", PC programmable, network of switching digital communication controllers with redundant controlling computers.

B. The system shall include all features and functions required for a fully operational integrated system. System shall be capable of adding optional features, equipment and interfaces.

2.4 SYSTEM CONFIGURATION

A. The system shall consist of digital communication controllers and remote cages as required. The digital communication controllers shall be interconnected with data and audio buses as required to provide maximum use of all audio channels and support the task group management system of the touch screen control and management system.

B. The digital communication controllers and all associated equipment shall be mounted in the equipment cabinets or the new cabinets as specified in Section 28 0555 and located as shown on the drawings.

C. System shall consist of duplex master stations with direct access buttons, with handsets, and with LCD displays, as indicated on the plans. Each master shall be capable of calling all other stations in the system unless specifically blocked or restricted through programming.

D. System shall include a "supervisor's" display type master control station at or near the central digital communication controller to function as system maintenance and fault indication station.

E. Administrative software shall be provided for management of all features and functions available on the system.

2.5 SYSTEM OPERATION

A. Touch Screen Stations shall be provided with the operation of a master stations integrated into the graphic presentation system as described in Touch Screen Presentation and Display System. A speaker/microphone interface with headset jack shall be located at each touch screen station.

B. Call placement from an intercom station: Integrate into touch screen presentation and display system.

1. Depressing an intercom station’s call push-button to place a call request in the queue of the master station or stations assigned to receive that station’s calls. Calls to be queued in order of priority level associated with the intercom station and time the call was placed.

C. Call answering at an intercom master station: Integrate into touch screen presentation and display system

1. Intercom master stations to be able to answer the top call request in its queue by depressing the ‘Next’ function key. At the completion of the call, the ‘End’ function key to close the communication link and remove the call from the queue.

2. Subsequent calls may be similarly handled for the remaining calls in the queue.

3. Queued calls may be answered out of sequence by scrolling through the queue to the desired call. The selected call to flash on the display and may be answered by depressing the ‘Enter’ key. ‘End’ key to close the communication link, remove the call from the queue and return the master station display to the top of the queue.

4. A call that is currently connected to a master station to display that the call is connected, the type of device connected, and the identity of the connected device.

D. Voice Communication

1. Telephone handset voice communication between intercom master stations shall be full duplex.

2. Open voice communications between intercom master stations to be automatically switched half duplex with press-to-talk override.

3. Voice communications between intercom master stations and intercom stations to be automatically switched half duplex with press-to-talk override.

E. Station audio monitoring:

1. Master stations to be able to monitor an individual intercom station or a pre-defined group of intercom stations.

2. System shall permit establishing as many station monitor groups as there are unused station ID numbers.

3. Each master station shall individually control the rate at which stations in the monitor group are sequenced through.

F. Paging distribution:

1. Master stations to have the ability to page to pre-determined groups of intercom stations and/or loudspeaker zones.

2. Paging selection shall be made by selecting the page function and a group or zone from the selection list. Alternately, the zone number may be entered after the page function has been selected.

G. Video surveillance system interface:

1. System to transmit command signals to the video surveillance system to route camera signals to viewing monitors via the electronic control system network.

2. Whenever a master station answers a call from an intercom station or places a call to an intercom station, camera(s) associated with the intercom station shall be displayed on the associated video monitor with the master station.

H. Audio logging:

1. System shall include the capability to interface to audio logging recorders for archival recording of each master station's communication.

I. Alarm handling:

1. System shall annunciate alarms and faults at the designated intercom master stations at each central control room.

2. Alarms shall be selectively acknowledged and canceled.

3. Event response programming to permit system output action to be automatically initiated upon receipt of each specific alarm.

2.6 EQUIPMENT AND PRODUCTS

A. DIGITAL COMMUNICATION CONTROLLERS (DCC's)

1. Digital Communication Controllers (DCC) to each form an intercom exchange capable of independent local operation. Each DCC Shall manage up to 13 VoIP master intercom stations and 200 intercoms with a maximum of 39 VoIP simultaneous audio channels.

2. Multiple DCC's to be networked together via Ethernet data networks to form larger systems. VoIP enabled systems shall utilize IEEE 802.1p/Q Quality of Service (QoS) compliant Ethernet networking equipment.

3. Each DCC shall include:

a. Process Control Card (PCC)

b. Internal PCI card (VoIP accelerator card)

c. Front panel keypad/display for system setup and maintenance.

d. 110 VAC, 60 Hz power supply for internal functions.

4. Process Control Card:

a. Process Control Card to contain system configuration and data, control exchange operations and switching, and provide exchange network ports.

b. Process Control Card to include:

1) USB network ports for exchange expansion.

2) Ethernet network ports for system expansion and external control by touch screen computers and graphic control panels.

3) Two serial ports.

4) An internal modem for transmitting and receiving data over a telephone line.

B. TALKBACK EXPANDERS (TBEs)

1. Talkback Expanders to provide 8 amplified paging outputs that can drive 25 Vrms loudspeaker circuits.

2. Each TBE is to:

a. provide 5 watts output per channel

b. allow adjacent channels to be bridged to obtain higher power.

c. provide talkback capability on all channels.

d. include Audio Level Alarm capability on all channels.

C. VoIP PAGING/TALKBACK AMPLIFIER (PTA)

1. Paging Talkback Amplifier to provide paging outputs that can drive 8 ohm or 25 Vrms loudspeaker circuits.

2. Each PTA is to;

a. provide 5 watts output

b. provides a line level output, line level input, two status inputs and a controlled DPDT relay output.

c. provide talkback capability allowing a two-way conversation to be carried out over the loudspeaker.

d. include Audio Level Alarm capability.

D. VoIP DESKTOP INTERCOM MASTER STATIONS (IMS-641)

1. VoIP desktop intercom master stations shall consist of a display, keypads, internal speaker & microphone, telephone handset with hook switch, headset jack, and large visual alarm indicator.

2. The display shall provide a 128x64 pixel graphical (backlit) LCD capable of displaying a “title” row, three “data” rows, and two “menu” selection rows of two fields each.

3. Four context sensitive “soft” keys shall be provided next to the “menu” selection rows (two on each side) to facilitate menu selections.

4. Four “navigation” keys shall be provided below the display to assist in navigating the menu system and to facilitate adjustment of various system settings.

5. A standard 12-key telephone as well as dedicated “Release”, “Mic Mute”, “Speaker”, “Volume Up”, and “Volume Down” keys shall be provided.

6. Fourteen programmable “feature” keys, each with an LED indicator shall be provided.

7. The VoIP master station shall provide an ADA compatible telephone handset with coiled cord, terminated on an RJ9 connector.

8. The VoIP master station shall be fabricated from ruggedized plastics and provide a scratch and impact resistant window for the display. A two position stand shall also be provided.

9. Overall dimensions (excluding the stand): 8.5” x 8” x 2”.

10. The network connection shall be a 10/100Mbps (RJ45 connector) Ethernet port with support for IEEE 802.3af inline power. A separate power connector shall also be provided in case an IEEE 802.3af compliant Ethernet switch is not available. The master station shall also provide support for the IEEE 802.1p/Q Quality of Service (QoS) standard.

E. VoIP TOUCH SCREEN INTERCOM MASTER STATIONS (TMM)

1. Desktop loudspeaker/microphone unit is to include compact, slim line bottom plate with stainless steel face, and rubber shock isolation mounting feet.

2. Unit to include a 12 inch, black, slim line electret gooseneck microphone, front mounted loudspeaker, front mounted rotary volume control, and front access headphone jack.

3. Unit to include support for a privacy handset.

4. Unit to include a line level audio output of the speaker signal.

5. Unit to include an audio line level input/output for connecting to a third party external feedback suppressor or equalizer.

6. Unit to include support for external PTT switch.

7. Built in Automatic Gain Control (AGC)

8. The network connection shall be a 10/100Mbps (RJ45 connector) Ethernet port with support for IEEE 802.3af inline power. A separate power connector shall also be provided in case an IEEE 802.3af compliant Ethernet switch is not available. The master station shall also provide support for the IEEE 802.1p/Q Quality of Service (QoS) standard.

9. Unit to include a 2-port 10/100Mbps Ethernet switch to facilitate the connection of a second Ethernet device.

F. VoIP INTERCOM STATIONS (ICE-600)

1. VoIP Intercom stations are to be designed for mounting on standard 2-gang outlet boxes. Faceplates to be constructed of 11-gauge brushed stainless. Internal steel offset grille to restrict inserting objects through speaker grille. Stations to be ruggedly constructed and resistant to damage from soil and sprays.

2. Each intercom station is to incorporate an internal loudspeaker, microphone preamplifier, and network interface circuitry. One pushbutton is to be provided on each station. Pushbuttons to be software assignable for placement of call requests or control of auxiliary functions.

3. Pushbuttons to be vandal resistant and constructed of stainless steel. Switch to have positive tactile action with 1 million-operation lifetime.

4. Loudspeakers to be waterproof mylar cone type.

5. Unit to include 2 status inputs, 1 status output, and 1 line level audio output. Line output to be configurable as a speaker output or a mix of the speaker and microphone signals.

6. The network connection shall be a 10/100Mbps (RJ45 connector) Ethernet port with support for IEEE 802.3af inline power. A separate power connector shall also be provided in case an IEEE 802.3af compliant Ethernet switch is not available. The master station shall also provide support for the IEEE 802.1p/Q Quality of Service (QoS) standard.

7. Outdoor intercom stations are to be identical in all respects to standard intercom stations except that all metal plates and hardware to be stainless steel, and internal circuitry and components to be conformally coated.

G. ADMINISTRATOR SOFTWARE

1. Administrator Software to function on a standard PC to support system configuration, diagnostics, maintenance, and logging but not be required for system operation.

2. Administrator Software to employ Windows features including views of system tree structure, tables of devices, screens for system settings and adjustments, and tables of operational data.

3. Configuration features to include:

   a. creation of overall system architecture.

   b. creation of multiple device templates.

   c. copy and paste functions with auto-numbering and auto-assignment to create device schedules.

   d. configuration error detection and alerts.

e. device naming and call routing functions.

f. device setting and performance functions.

H. DISCRETE I/O MODULES

1. Each Discrete I/O (input/output) module shall interface up to 48 contact closure type input monitor points and 48 solid-state output control points. Outputs are to be current sink (voltage source, LED driver, form C contact) type.

2. Inputs are to be supervised (non-supervised) for open circuit and short circuit faults in field wiring. With terminating resistors, each supervised input is able to monitor two contact points for a total of 96 inputs.

3. DIO modules to be rack or wall mounted.

I. NETWORK REPEATERS

1. Network repeaters are to extend LonWorks network cable limits or increase node limits. Each unit shall include four network ports. Data received on any port to be re-transmitted on the other ports.

2. Units to be surface wall mounted and include depluggable screw terminal connectors, redundant power supply connections and internal fuse to protect circuitry.

3. Six (6) LED’s to indicate receiving port, network activity, and power supply status.

J. ADMINISTRATOR SOFTWARE

1. Administrator Software shall function on a standard PC to support system configuration, diagnostics, maintenance, and logging but not be required for system operation.

2. Administrator Software shall employ Windows features including views of system tree structure, tables of devices, screens for system settings and adjustments, and tables of operational data.

3. Configuration features to include:

a. creation of overall system architecture.

b. creation of multiple device templates.

c. copy and paste functions with auto-numbering and auto-assignment to create device schedules.

d. configuration error detection and alerts.

e. device naming and call routing functions.

f. device setting and performance functions.

4. Diagnostic and Maintenance features to include:

    a. verification of system configuration and installation.

    b. verification of system networks.

    c. verification of device connections.

    d. verification of system operation.

    e. diagnostics via modem or Ethernet ports.

5. Logging features to include:

    a. display of system activity with filtering options.

    b. search by time and date.

    c. search by device.

    d. search by parameter.

K. Emergency call pushbutton:
1. Call operating devices to be large red pushbutton switch actuators that are software assignable to call request, call cancellation, acknowledge, event initiation or other similar system function.
2. Units to be constructed with single gang 11 gauge brushed stainless steel faceplate suitable for mounting on standard single gang outlet box.
3. Emergency call pushbutton and plunger to be single piece stainless steel construction with backstop plate to limit excessive button travel.
4. Units shall include line supervision circuitry and include conformal coating on components for weatherproof locations.
5. Model:
    a. Harding Instruments COD-210

L. Intercom Station Boards:
1. Intercom station boards are to be used to interface generic intercom stations and loudspeakers to system station audio boards for two-way voice communication or audio monitoring.
2. Units are to include microphone preamplifier, line supervision electronics, multiplexing electronics, and loudspeaker transformer.
3. Units are to include pigtail and switch options as required for each location.

M. Paging amplifiers:
1. Provide paging amplifiers and zone switching as required to perform the functions described herein and indicated on the drawings.
2. Paging amplifiers to be the constant voltage output type with power output capacities to drive the loudspeakers connected at sufficient levels with no more than 90% amplifier loading.

N. Paging Speakers:
    a. Paging Horns/Speakers - Recess Mount:

1) Provide horn of weatherproof construction
2) Provide integral line transformer with power taps
3) Frequency response 475 - 14,000 Hz
4) Minimum Dispersion: 180 deg
5) Power rating: 15 watts continuous
6) Model:
   a) Quam H16
   b) Or equal
7) Enclosure Recessed Mount: ES-8, ES8-6
8) Enclosure Surface Mount: SE1WVP, SE1WVPS, SE2WVP
9) Ceiling Mount : ERD-8, ERD8U
10) Baffle: BS8VPS

2. Interior paging speakers for non-secure areas:
   a. Speakers:
      1) 8 IN, seamless cone type
      2) Frequency Response: 60 - 16,000 Hz minimum
      3) Power rating: 15 watt normal, 25 watt peak
      4) Minimum Dispersion: 100 degrees
      5) Sensitivity: 96 dB
      6) Voice coil: 1 IN diameter
      7) Impedance: 8 ohm
      8) Transformer: Preassembled with speaker, multiple power taps
      9) Model:
         a) Quam C10X/B70/WS
         b) Or equal
      10) Enclosure: ERD-8, ERD8U
      11) Mounting kit: SSB-2, SSB-3, SSB-7

3. Provide mounting hardware to secure speaker to grille and grille to back box.
4. Attach with security fasteners.
5. Provide weatherproof housing and pedestal for mounting intercoms in outside areas as indicated on drawings.

2.7 VEHICLE DETECTOR

A. Install vehicle detector below concrete driveway where indicated and connect to initiate call-in on intercom system station.

B. The driveway sensor shall detect variations within the earth's magnetic field resulting from the motion of ferrous metal objects. The driveway sensor shall contain all processing circuitry necessary to directly connect to alarm control panels, timers, or transmitters. It shall incorporate Faraday shielding to minimize false alarms from external electromagnetic sources.

C. Connect alarm contact to programmable logic controller input and program to provide call in to intercom system. Connect to NC alarm contacts where available.

D. Provide a 12VDC power supply. Install power supply and processor in NEMA 1 enclosure in equipment room.

E. Model:
   1. MFM sensors #D-373.

2.8 POWER SUPPLY

A. Provide power supplies as required for audio equipment and functions. Power supplies shall conform to requirements of NEC Article 725. Provide over current protection of primary and distribute secondary over current protection for secondary wiring circuits.
   1. Class 1 power supplies shall be provided with over current protection as required by NEC Article 725. Provide over current protection for all conductors in accordance with ampere rating. Minimum conductor size served by a Class 1 power supply shall be 18 GA.
   2. Class 2 power supplies shall be power limited and/or over current protected in accordance with NEC Article 725. Nameplate rating of power supply shall not exceed limits indicated in NEC Article 725. Minimum conductor size served by a Class 2 power supply shall be 22 GA.
   3. Size power supplies to accommodate nameplate load of all components.
   4. Load on power supplies shall not exceed 90 percent of nameplate rating of power supply.

B. Power Source (120 VAC) for equipment shall be provided by Division 16. Provide terminals for all incoming circuits provided.

2.9 WIRE AND CABLE

A. Provide special cable and interface to accommodate field wiring:

B. Provide wire and cable for operation described. Provide separate cable for each intercom station.

   1. Talk-back Page only: Minimum 22 GA one shielded pair. Daisy-Chained per zone.
      a. Manufacturer (dry application):
         1) Belden 9462
         2) West Penn 291
         3) Comm/Scope, Inc.S222SSTR
         4) Liberty 22-2C-SH-GRY
      b. Manufacturer (wet application):
         1) Belden 5501G1
         2) West Penn AQC291
         3) Comm/Scope, Inc.
         4) Liberty
   2. Factory manufactured field interface cables to be provided, as required, for all:

      a. CBL-MST-A male DB-15 connector with 6 individually shielded twisted pairs for connecting to master station ports.

      b. CBL-STN-A male DB-37 connector at one end with 16 individually shielded twisted pairs for connecting from station control card audio port to terminal blocks.

      c. CBL-STQ-A with male DB-37 connectors at both ends and with 16 individually shielded twisted pairs. For connecting from station control card audio ports to QCB-120-1 Quick Connect Board.

d. CBL-SWT-A male DB-25 connector at one end with 16 individually unshielded twisted pairs for connecting from SCC- 300 station control card switch port to a terminal block.

e. CBL-SWQ-A with male DB-37 connectors at both ends and with 16 unshielded twisted pairs. For connecting from SCC- 300 station control card switch port to QCB-120-2 Quick Connect Board.

3. Field wiring to conform to manufacturer's recommendations.

C. Data cable shall be Category 6. Limit cable lengths to 100 meters maximum.

1. Data Cable: Unshielded 4-Pair shall exceed all requirements for ANSI/EIA/TIA-568-A-5 and support high speed communication network applications.

a. Category 6:

1) Belden: 7881A – Dry, Wet not available

2) West Penn: 4246 – Dry, M57562 – Wet

3) Comscope: 75N4 – Dry, 6NF4+ – Wet

2.10 SPARE PARTS (SEE SECTION 280510)

A. Deliver spare parts in protective wrapping and packaging for proper storage.

B. Provide the following spare parts:

1. Touch Screen Master Station: Two (2)

2. Master Stations: Two (2)

PART 3 - EXECUTION

3.1 INSTALLATION (SEE SECTION 280510)

A. Shall be installed by qualified technicians who has been factory trained and certified.

B. Wiring shall be uniform and in accordance with codes, standards and manufacturer's instructions.

C. Equipment shall be firmly secured, plumb, and level.

D. All cable runs at the main terminal board and in all junction boxes shall be tagged and identified.

E. Coordinate all work with other effected trades and contractors.

F. Microphone, line and speaker levels shall be run in separate raceways and shall be separated from one another and from power cabling in racks and on terminal boards.

G. Comply with the manufacturer's recommendations, procedures and standards for the setup and adjustment of the systems installed.

1. Make all intercom speaker tap and amplifier gain adjustments prior to performance testing as follows:

a. Intercom Speaker Tap Adjustments: Select intercom taps for 75 dBA at 4 feet on-axis with power input equal to tap setting (e.g. at 1/2-watt input).

b. Once set, mark or identify all adjustment settings on the amplifiers and accessories.

3.2 WIRING (SEE SECTION 280510)

A. Provide wiring as recommended by manufacturer but no less that specified herein.

3.3 SYSTEM INITIALIZING AND PROGRAMMING

A. System shall include all software necessary for system configuration.

B. System shall be turned on and adjustments made to meet requirements of specifications and on-site conditions.

C. System shall be programmed to function as specified.

D. Directory numbers, feature codes, and special programming shall be documented, printed and made available to owner.

3.4 SYSTEM TESTING (SEE SECTION 280510)

A. Contractor to verify and document the full and proper operation of the complete system and system interfaces provided under this contract.

B. Verification to include testing of all communication links including dialing, call request and cancel functions, volume level, and volume level adjustment. Proper routing of associated camera signals to operator monitors to be confirmed.

C. System monitoring, paging, and program distribution to be verified for all devices providing those functions.

D. All applicable intercom master station call handling and system control functions to be verified for each master station.

E. Performance verification to ensure that system is configured as directed by the Owner for proper support of the facility's operation.

F. Provide site services of manufacturer's representatives for testing, adjusting and balancing to ensure compliance with the Contract Documents. Factory trained technician in direct employ of the supplier shall provide on-site services for a minimum of 40 hours prior to the tests upon completion of the work to confirm system programming and operation.

3.5 OWNER PERSONNEL TRAINING (SEE SECTION 280510)

A. Provide instruction in field programming of the equipment.

B. Provide site services of appropriately qualified manufacturer's representatives where site training performed by the manufacturer's representatives is required to ensure compliance with the Contract Documents.

C. Training Outline-Operational staff

1. Functions performed
2. Acknowledgement/Responses
3. Control Functions
4. Emergency Staff Communications

D. Training Outline-Maintenance Staff

1. Systems Operation
2. Component Review
3. Routine Maintenance/Adjustments
4. Troubleshooting/Repair
5. Expansion Capabilities
6. System Programming

END OF SECTION

SECTION 31 11 00

CLEARING AND GRUBBING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Clearing and grubbing of vegetation.

B. Removal and disposal of asphalt concrete and concrete pavement.

C. Removal and disposal of existing chain link fences and gates.

D. Abandonment and removal of existing utilities and utility structures.

1.2 RELATED SECTIONS

A. Section 31 22 00 Grading

B. Section 32 11 23 Aggregate Base Courses

C. Section 32 12 16 Asphalt Paving

D. Section 32 16 00 Curbs, Gutters, Sidewalk, and Driveways

1.3 PROJECT CONDITIONS

A. Minimize production of dust due to clearing operations.

B. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewer, or other pollution.

C. The site will have been prepared using rapid in-place compaction. Coordinate with the County for applied compaction effort, location, and compacted depth.

1.4 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 01.

1.5 SCHEDULING

A. Schedule work under the provisions of Division 01.

PART 2 PRODUCTS

2.1 MATERIALS

A. Fill Material: As specified in Section 31 22 00 - Grading

PART 3 EXECUTION

3.1 SCOPE

A. County will remove existing buildings and utilities prior to Contractor mobilization. Remnants of concrete flatwork, asphalt concrete pavement and underground utilities are expected to be on site and subject to removal.

B. Removing asphalt concrete and concrete paving as required and indicated on plans.

C. Within area of construction, remove miscellaneous features as indicated on plans, that may include, but not be limited to fencing, fence gates, and bollards.

D. Remove utilities and utility structures, including but not limited to drain inlets, storm water conveyance pipes, water and sewer pipes or services.

E. Remove other site items as indicated for salvage, relocation, or recycling.

F. Fill excavations, open pits, and holes in ground areas generated as result of removals using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

3.2 PREPARATION

A. Stake and flag locations of known utilities.

B. Locate, identify, and protect from damage above- and below-grade utilities to remain.

C. Protect site features to remain, including but not limited to benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.

D. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.

3.3 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.

1. Obtain required permits.
2. Use of explosives is not permitted.
3. Provide, erect, and maintain temporary barriers and security devices.
4. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
6. Do not close or obstruct roadways or sidewalks without permit.
7. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.

B. Do not begin site clearing until receipt of notification to proceed from the County.

C. Do not begin site clearing until built elements to be salvaged or relocated have been removed.

D. If hazardous materials are discovered during site clearing operations, stop work and notify he County; hazardous materials include regulated asbestos containing materials, lead, PCBs and mercury.

E. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.4 REMOVE ASPHALT CONCRETE PAVEMENT

A. Completely remove and dispose asphalt concrete pavement (bituminous surfacing, aggregate base and subgrade) shown on the plans.

B. Sawcut the asphalt pavement as needed to complete concrete curb work a minimum of one foot offset from curb line or as shown on the plans in accordance with Paragraph 3.05 “Sawcutting.”

3.5 REMOVE CONCRETE IMPROVEMETNS

A. Remove and dispose of concrete curb, gutter, and sidewalk as required to place the new improvements.

B. Sawcut at the interface with the existing improvements, and as indicated on the plans in accordance with Paragraph 3.6 “Sawcutting.”

3.6 SAWCUTTING

A. Cut outline of portion of existing surfacing, curb, gutter, and other facility area to be removed on a neat line with a power driven saw to an adequate depth to ensure a clean break, but not less than 2 inches deep, prior to removing the surfacing or other facility.

B. Remove cuttings, liquids, and waste from sawing operations prior to entering any waterway or inlet.

3.7 CLEARING AND GRUBBING

A. Remove shrubs, brush, and stumps within limit of work.

B. Do not remove or damage vegetation beyond the limits indicated on plans.

1. Exception: Specific trees and vegetation indicated on plans to be removed.
2. Exception: Selective thinning of undergrowth specified elsewhere.

C. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:

1. At vegetation removal limits.
2. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
3. Around other vegetation to remain within vegetation removal limits.

D. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

E. Vegetation Removed:

1. Do not burn, bury, or leave on site, except as indicated.
2. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.

F. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.

G. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to the County.

H. Nothing herein shall be construed as relieving the Contractor of responsibility for final cleanup.

I. Do not stockpile items removed in conjunction with clearing and grubbing operations. Remove and dispose of all such materials from the site on the same day as the clearing and grubbing operations.

3.8 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to the County.

E. Do not close, shut off, or disrupt existing utility branches that are in use without at least 3 days prior written notification to the regulating utility agency.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.9 DEBRIS AND WASTE REMOVAL

A. Remove debris and trash from site. Dispose of facilities and materials not designated to be salvaged outside the project area in permitted disposal facilities.

B. Remove from site all materials not to be reused on site; comply with requirements related to Construction and Demolition Waste Management.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from surrounding areas.

END OF SECTION

SECTION 31 22 00

GRADING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Earthwork, grading, and subgrade preparation for hot-mix asphalt (HMA) paving and placing of aggregate base.

B. Earthwork, grading and subgrade preparation for placing PCC improvements.

C. Earthwork and grading for bioswale and bio-retention basin construction.

1.2 RELATED SECTIONS

A. Section 32 11 23 Aggregate Base Courses

B. Section 32 12 16 Asphalt Paving

C. Section 32 16 00 Curbs, Gutters, Sidewalk, and Driveways

1.3 REFERENCE STANDARDS

A. ASTM D1557-12(2021) - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).

1.4 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

B. Compaction Density Test Reports.

1.5 PROJECT CONDITIONS

A. Protect above- and below-grade utilities that remain.

B. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs to remain from grading equipment and vehicular traffic.

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 01.

1.7 SCHEDULING

A. Schedule work under the provisions of Division 01.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that intended elevations for the work are as indicated.

3.2 PREPARATION

A. Stake and flag locations of known utilities.

B. Locate, identify, and protect from damage above- and below-grade utilities to remain.

C. Protect site features to remain, including but not limited to benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.

D. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.

3.3 GRADING AND COMPACTION

A. Grading shall be done according to the slopes and grades shown on the plans (plans show finish grade elevations).

B. Moisture condition subgrade material to the optimum moisture content as obtained by ASTM D1557-12(2021). Compact to 95 percent maximum dry density, or as approved by Owner's Representative.

C. Yielding subgrade shall be over-excavated to a depth of 6 to 12 inches and replaced with aggregate base or crushed rock and the use of a stabilizing geogrid to be placed on the subgrade. Maximum compacted lift thickness of replacement material shall be 6 inches.

D. When excavating through roots, perform work by hand and cut roots with a sharp saw.

E. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.4 SOIL STOCKPILING

A. Excess soils that will not be reused shall be hauled off site.

B. Stockpile subsoil to be re-used on site; remove remainder from site.

C. Stockpiles: Use areas as selected by the Owner's Representative; pile depth not to exceed 6 feet; protect from wind and water erosion.

3.5 TOLERANCES

A. Top Surface of Subgrade: Plus, or minus 1/2 inch from required elevation.

B. Top Surface of Finish Grade: Plus, or minus 1/2 inch.

3.6 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds in coordination with Owner's Representative; if root damage has occurred, obtain instructions from the Owner as to remedy.

C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.7 FIELD QUALITY CONTROL

A. Inspection and testing will be performed under provisions included in Division 01.

B. As directed by the Owner's Representative, the Owner's Geotechnical Engineer will:

1. Test any fill material from source designated by the Contractor and any site materials stockpiles for use as fill; observe excavation and check stability of subgrade, compacted fill, and backfill.
2. Be present at the site intermittently during conduct of work to observe performance of work and soil conditions encountered.
3. Perform laboratory and field density tests to evaluate compaction achieved.
4. Observe and provide engineering opinions as to adequacy of excavation, compaction of subgrade, and placement and compaction of fill and backfill. Engineering opinions will be based on observations of work performed as well as tests and inspections deemed necessary by the Owner's Geotechnical Engineer to ensure compliance with Contract Documents.
5. Observe methods of compaction and report findings to the Owner's Representative.
6. Issue final report to the Owner's Representative on grading; include opinion regarding degree of compliance with specifications.

C. The Contractor shall

1. Cooperate with the Owner's Geotechnical Engineer in all aspects of the work.
2. Notify the Owner's Representative and the Owner's Geotechnical Engineer at least 4 working days prior to required observation or testing.
3. Be responsible for expense of all retesting of subgrade, fill, aggregate base, backfill, or other controlled material found to be inadequate at firsts testing, including fees for travel, personnel time, laboratory expenses, office work, supervision, and testing which may be incurred by reason of such retesting. The Owner's Representative will deduct such expenses from monies due the contractor under the contract.

D. No earthwork shall be performed without direct knowledge of the Owner's Geotechnical Engineer unless otherwise directed by the Owner's Representative.

3.8 CLEANING

A. Remove stockpiled subsoil according to Owner's instructions.

B. Grade stockpile area to prevent standing water.

C. Surplus material and debris becomes property of the Contractor for off-site disposal in accordance with applicable state and local codes, ordinances, and regulations.

END OF SECTION

SECTION 31 22 19

FINISH GRADING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Weeding and finish grading of lawn and planting areas.

B. Preparing subgrades for lawns, and planting areas.

C. Excavating and backfilling trenches for buried irrigation and associated electrical utilities and pits for buried irrigation components.

1.03 MEASUREMENT AND PAYMENT

A. Payment of the various Construction Items described in the Schedule of Values shall be considered full compensation for work of this Section.

1.04 RELATED SECTIONS

A. Section 31 11 00 – Clear and Grub, site stripping, grubbing, removing topsoil, and protecting trees to remain.

B. Section 31 20 00– Earthwork, for grading.

C. Section 32 90 00 – Planting, finish grading, including placing and preparing topsoil for lawns and plantings.

1.05 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.

2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

D. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation: Excavation below subgrade elevations as directed by Landscape Architect. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Landscape Architect. Unauthorized excavation, as well

as remedial work directed by Landscape Architect, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

H. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

I. Finish Grading: Finish grading shall consist of finishing surfaces by raking smoothly and evenly, removing, and disposal of extraneous matter to facilitate natural run-off water.

1.06 SUBMITTALS

A. Samples: For the following:

1. 12-by-12-inch (300-by-300-mm) sample of separation fabric.

1.07 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Landscape Architect and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Landscape Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Landscape Architect's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. General:

1. Conform to the Geotechnical (Soils) Report prepared for the project.
2. Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Backfill and Fill: Satisfactory soil materials.

E. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (38-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

2.02 ACCESSORIES

A. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile: made from polyolefins, polyesters, or polyamides: and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 200 lbf (890 N); ASTM D 4632.
2. Tear Strength: 75 lbf (333N); ASTM D 4533.
3. Puncture Resistance: 90 lbf (400N); ASTM D 4833.
4. Water Flow Rate: 4 gpm per sq. ft. (2.7 L/s per sq. m); ASTM D 4491.
5. Apparent Opening Size: No. 30 (0.6 mm); ASTM D 4751.

PART 3 - EXECUTION

3.01 GENERAL

A. Conform to the Geotechnical (Soils) Report prepared for the project.

3.02 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.03 EXPLOSIVES

A. Explosives: Do not use explosives.

3.04 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditioned encountered, including rock, soil materials, and obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.05 EXCAVATION FOR IRRIGATION TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

3.06 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.07 IRRIGATION TRENCH BACKFILL

A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Place and compact initial backfill free of particles larger than 1 inch to a height of 4 inches over the utility pipe or conduit.

1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of irrigation piping or conduit to avoid damage or displacement of utility system.

C. Coordinate backfilling with utilities testing.

D. Place and compact final backfill of satisfactory soil material to finish grade.

3.08 FILL AND LANDSCAPE MOUNDING

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

C. Place and compact fill material in layers to required elevations. Mounding to be installed in natural undulating form and to the heights and extents as indicated on the drawings. Contractor to notify Landscape Architect when mounding has been completed for review and approval of mounding.

3.09 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 6 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, steps, and pavements, scarify and re-compact top 12 inches of existing subgrade and each layer of backfill or fill material at 95 percent.
2. Under walkways, scarify and re-compact top 6 inches below subgrade and compact each layer of backfill or fill material at 92 percent.
3. Under lawn or unpaved areas, scarify and re-compact top 6 inches below subgrade and compact each layer of backfill or fill material at 85 percent.

3.10 LANDSCAPE GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Landscape Grading: Slope grades to direct water away from buildings and to prevent ponding. Provide positive drainage swales from all buildings, walkways, etc. to drainage catch basins or site drainage swales. No ponding is to be allowed. Finish subgrades to required elevations within the following tolerances:
   1. Lawn or Unpaved Areas: Plus or minus 1 inch.
   2. Walks: Plus or minus 1 inch.
   3. Pavements: Plus or minus 1/2 inch.

C. Grading for Shrubs and Ground Cover: The finish grade of shrubbery and ground cover areas shall be 1½ inches below grade of adjacent pavement, walks, curbs, or headers and 3 inches below adjacent walls, except when drainage conditions may require flush grades, as directed by Landscape Architect.

D. Immediately prior to planting operations, planting areas shall be cleaned of weeds, debris, rocks over 1 inch in diameter, and clumps of earth that will not break up. Adjust any areas disturbed by installation of sprinkler irrigation system.

3.11 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.12 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 32 01 90

LANDSCAPE MAINTENANCE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Weeding

B. Watering

C. Spraying

D. Fertilizing

E. Pesticide Use

F. Trash pick up

1.03 MEASUREMENT AND PAYMENT

A. Payment of the various Construction Items described in the Schedule of Values shall be considered full compensation for work of this Section.

B. Unit prices for soil preparation and for items that include backfill mixes shall be adjusted to reflect changes due to the requirements of soil lab recommendation.

1.04 RELATED SECTIONS

A. Section 32 80 00 – Irrigation.

B. Section 32 90 00 – Planting

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with all applicable codes regulations of governmental agencies having jurisdiction. Where those requirements conflict with the specifications, comply with the more stringent provision.

B. Contractor or an experienced crew chief shall be present during maintenance operations.

1.06 PROTECTION AND CLEAN UP

A. Protection of persons and property shall be provided throughout progress of work. Use temporary barricades as required. Work shall proceed in such a manner as to minimize spread of dust and flying particles and to provide safe working conditions for personnel.

B. Execute all work in an orderly and careful manner to protect new concrete walks, work of other trades, and other improvements.

C. Maintain cleanliness on paving areas and other public areas used by equipment, and be responsible for immediate removal of all spillage. Remove from the project site all rubbish and debris found thereon leaving the site in a safe and clean condition.

1.07 START AND LENGTH OF LANDSCAPE MAINTENANCE PERIOD

A. Landscape maintenance period does not start until all landscaping work has been completed, all punch list items have been corrected, and the landscape has been approved in writing by the Landscape Architect or the owner's representative.

B. All items that have been listed in the punch list as items that may be corrected during the maintenance period must be done so prior to the last day of the maintenance period. The contractor will be responsible for an extended maintenance period until all items have been addressed to the satisfaction of the Landscape Architect and/or owner's representative.

C. Landscape Maintenance period shall extend for the time period as specified on the plans or through an agreement with the owner. During this time, continually maintain all areas involved in this Contract until final acceptance by the Landscape Architect. Improper maintenance or poor condition of any plantings at the end of the maintenance period may cause postponement of the final completion date. Maintenance shall be continued until all work is accepted.

D. Final inspection at the end of the maintenance period shall include an overview with the owner new maintenance contractor.

1.08 GUARANTEE

A. Guarantee all new plant materials for a period of one year. Plants not alive or in satisfactory growing condition as determined by the Landscape Architect, shall be replaced within one week of notification without additional cost to the owner.

B. Replacement guarantee shall include all plants damaged or destroyed by any action, including but not limited to vandalism, theft, vermin, neglect, etc. All replacement shall be plants of the same kind and size and installed as specified in the plans.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All materials used shall be in conformance with Sections 32 80 00 and 32 90 00, or any other applicable specification.

PART 3 - EXECUTION

3.01 SPRINKLER IRRIGATION SYSTEM

A. Check the system weekly for proper operation. Lateral lines shall be flushed out when needed. All sprinkler heads are to be adjusted as necessary for unimpeded coverage with no overspray onto buildings and minimal overspray onto paving.

B. Set and program automatic controller for seasonal water requirements based on irrigation audit or schedule. Give owner's representative a spare key to the controller with instruction as to operation for emergency purposes.

C. Repair all damage to irrigation system at Contractor's expense and in a timely manner. Repairs are to be made within one watering period or one week, whichever is shortest.

3.02 GENERAL LANDSCAPE MAINTENANCE

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditioned encountered, including rock, soil materials, and obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.03 STORAGE OF SOIL MATERIALS

A. All planted areas shall be completely weeded and/or cultivated weekly. Sidewalks, gutters, etc. shall be cleaned weekly. Failure to comply will result in an extension of the maintenance period as determined by the Landscape Architect.

B. All planting shall be kept in a healthy growing condition by watering, weeding, cultivation, pruning, mowing, edging, spraying, fertilizing, and by performing any other necessary operation of maintenance.

C. Landscape is to be maintained to meet the desired intent of the plans. Hedges are to be pruned and trained as a hedge. Informal shrub masses, groundcovers, and grass-like plants are not to be formally pruned into individual balls or boxes. Pruning is to be done in relation to the growth pattern of the individual plant species.

3.04 GROUNCOVER, TREES, AND SHRUBS

A. Water enough so that moisture penetrates throughout the root zone and only as frequently as necessary to maintain healthy growth. Water shall not be allowed to run over sidewalk or to pool in shrub areas.

B. Construct and or remove water basins around individual plants, depending on the time of year and as directed.

C. Do not prune unless directed.

D. Re-stake and re-tie trees as needed. Reset to grade or up-right any plants that are not in their proper growing position.

E. Immediately remove any dead or dying plants and replace per this specification.

3.05 HERBICIDE APPLICATION

A. If needed control weeds with selective herbicides and sprays that have been approved for use by governing jurisdictions.

B. Material, timing, rate of application, and application shall be performed by a licensed Pest Control Operator.

C. Provide a monthly report to the owner of all herbicides, insecticides, and disease control chemicals used as well as the dates and rates of application.

D. Apply pre-emergent weed control at end of maintenance period.

3.06 TRASH PICK-UP

A. All trash and/or debris found in planted or paved areas shall be removed from the site on a weekly basis.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aggregate base shoulder.

B. Aggregate base course underneath asphalt concrete pavement, concrete curbs, and flatwork.

C. Aggregate base for backfill of over-excavated areas.

1.2 RELATED SECTIONS

A. Section 31 22 00 Grading

B. Section 32 16 00 Curbs, Gutters, Sidewalk, and Driveways

C. Section 32 12 16 Asphalt Paving

1.3 REFERENCE STANDARDS

A. ASTM C136-14 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D1557-12e1 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN m/m^3)).

C. ASTM D2487-11 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

D. ASTM D4318-10e1- Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

E. ASTM D6938-15 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.4 SUBMITTALS

A. Submit in Accordance with Section 01 33 23, Shop Drawings, Product Data, and Samples.

B. Samples: 50 lbs. sample of each type of aggregate; submit in air-tight containers to testing laboratory.

C. Materials Sources: Submit name of imported materials source.

D. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

E. Compaction Density Test Reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When aggregate materials need to be stored on site, locate stockpiles where designated.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials.

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 01.

1.7 SCHEDULING

A. Schedule work under the provisions of Division 01.

PART 2 PRODUCTS

2.1 MATERIALS

A. Class 2 Aggregate Base, 3/4-inch maximum, conforming to Section 26 of the 2018 State Standard Specifications.

2.2 SOURCE QUALITY CONTROL

A. Where aggregate materials are specified using ASTM D2487-11 classification, test and analyze samples for compliance before delivery to site.

B. If tests indicate materials do not meet specified requirements, change material and retest.

C. Provide materials of each type from same source throughout the work.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate has been inspected, gradients and elevations are correct, and subgrade is dry.

3.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.3 INSTALLATION

A. Under hot-mix asphalt paving:
   1. Place Class 2 Aggregate Base, 3/4-inch maximum to a total compacted thickness of 6 inches.
   2. Compact to 95 percent of maximum dry density as determined by ASTM D1557-12e1.

B. Under PCC parking pad and dumpster:
   1. Place Class 2 Aggregate Base, 3/4-inch maximum to a total compacted thickness of 6 inches.

2. Compact to 95 percent of maximum dry density as determined by ASTM D1557-12e1.

C. Under concrete curb, curb and gutter, and sidewalk:

1. Place Class 2 Aggregate Base, 3/4-inch maximum to a total compacted thickness of 4 inches under sidewalk and 6 inches under concrete curb or curb and gutter.
2. Compact to 95 percent of maximum dry density as determined by ASTM D1557-12e1.

D. Place aggregate base and roller compact to specified density.

E. Level and contour surfaces to slopes indicated.

F. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

G. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

H. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A. Flatness: Maximum variation of 1/2 inch measured with 10-foot straight edge.

B. Scheduled Compacted Thickness: Within 1/2 inch.

3.5 FIELD QUALITY CONTROL

A. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D6938-15.

B. Results will be evaluated in relation to compaction curve determined by testing un-compacted material in accordance with ASTM D1557- 12e1 ("modified Proctor").

C. If tests indicate work does not meet specified requirements, remove work, replace, and retest at no additional cost to the County.

D. Frequency of Tests:

1. One test per 2,000 square feet of aggregate base placed for HMA pavement.
2. One test per 100 linear feet of aggregate base for concrete sidewalk, curb, or curb and gutter construction.
3. One test per 500 square feet of aggregate base that will be under concrete parking and concrete dumpster areas.

3.6 PROTECTION

A. Immediately after placement, protect aggregate base from mechanical injury, excessive water, and frost until HMA or PCC pavement is placed.

END OF SECTION

SECTION 32 12 16

ASPHALT PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hot-mix asphalt paving (4-inch thickness in 2 lifts).

B. Tack coat.

1.2 RELATED SECTIONS

A. Section 31 22 00 Grading

B. Section 32 11 23 Aggregate Base Courses

1.3 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 01.

1.4 SCHEDULING

A. Schedule work under the provisions of Division 01.

PART 2 PRODUCTS

2.1 MATERIALS

A. Asphalt Binder for HMA: Performance Graded (PG) asphalt binder PG 64-28 according to Section 92 Asphalts of the 2018 State Standard Specifications.

B. Aggregate for HMA in base courses: 3/4-inch gradation, Type A

C. Aggregate for HMA wearing course: 3/4-inch gradation, Type A

D. Tack Coat: Type SS1h according to Section 94 Asphaltic Emulsions of the 2018 State Standard Specifications.

2.2 ASPHALT PAVING MIXES AND MIX DESIGN

A. Contractor shall furnish hot-mix asphalt (HMA) using reclaimed asphalt pavement (RAP) and shall comply with the requirements of Section 39-1.02F Reclaimed Asphalt Pavement of the 2018 State Standard Specifications.

B. Submit proposed mix designs for review prior to beginning of work.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.2 SUBGRADE

A. Subgrade to receive HMA must comply with the compaction and elevation tolerance specifications in the sections for the material involved.

B. Remove loose paving particles, dirt, and other extraneous material by any means including flushing and sweeping.

3.3 PREPARATION - TACK COAT

A. Apply tack coat in accordance with manufacturer's instructions.

B. Apply tack coat on asphalt (horizontal and vertical cut surfaces) or concrete surfaces at uniform rate of 0.03 gallons per square yard (gal/sq yd) minimum residual rate.

C. Apply tack coat to contact surfaces of existing pavement (planed pavement) at uniform rate of 0.05 gal/sq yd minimum residual rate.

D. Apply tack coat between lifts at uniform rate of 0.02 gal/sq yd minimum residual rate.

E. Coat surfaces of manhole frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.4 PLACING ASPHALT PAVEMENT

A. Place asphalt pavement to a maximum of 2 inches compacted thickness.

B. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

C. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.5 TOLERANCES

A. Smoothness shall be according to Section 39-1.12B Straightedge of the 2018 State Standard Specifications

B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.

C. Variation from True Elevation: Within 1/2 inch.

3.6 FIELD QUALITY CONTROL

A. Perform quality control according to Section 39-2 Standard Construction Process of the 2018 State Standard Specifications.

B. The Owner’s Representative will:

1. Inspect and test base and paving in accordance with the 2018 State Standard Specifications, including but not limited to:
    a. Compaction and thickness of base.
    b. Compaction and thickness of asphalt concrete.
    c. Temperature of asphalt concrete just prior to and during paving.

C. Check thickness of surfacing by coring when requested by the Owner’s Representative.

D. Contractor shall:

1. Flood all paved surfaces with water to verify positive drainage.
2. Repair areas cored for testing.
3. As requested by the Owner's Representative, remove, and replace or repair all paving not meeting Contract Document requirements at no cost to the County.

3.7 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 2 days or until surface temperature is less than 140 degrees F.

END OF SECTION

SECTION 32 15 40

STABILIZED DECOMPOSED GRANITE (DG) PAVING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Material and labor requirements for construction with decomposed granite paving with Stabilizer binder additive.

1.02 MEASUREMENT AND PAYMENT

A. Payment of the various Construction Items described in the Schedule of Values shall be considered full compensation for work of this Section.

1.03 REFERENCE STANDARDS

A. ASTM C 136 – Method for Sieve Analysis for Fine and Course.

1.04 PERFORMANCE REQUIREMENTS

A. Perform gradation of decomposed granite in accordance with ASTM C 136 – Method for Sieve Analysis for Fine and Course.

1.05 SUBMITTALS

A. Submittals shall comply with Submittals section and provisions of these specifications.

B. Submit the following material certifications:

1. Product Data: Manufacturer's literature describing stabilizing binder.
2. Sample: Decomposed granite – 1 pint sample
3. Design Data: Mix formula indicating the ratio of stabilizer binder to granite fines by weight.
4. Certification: Written certification from manufacturer that installer is properly trained to install the product. Alternately, contractor may retain the services of a manufacturer's representative to observe the first day's installation.
5. Test Reports

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Installer to provide evidence to indicate successful experience in providing decomposed granite surfacing containing Stabilizer binder additive or ability to follow installation instructions.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in their original bulk condition or unopened containers, showing weight, analysis, and name of manufacturer.

B. Store materials in a manner that prevents wetting and deterioration.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Do not install decomposed granite paving during rainy conditions or below 40 degrees Fahrenheit and falling.

1.09 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty executed by the installer agreeing to repair or replace components of stabilized surfacing that fail in materials or workmanship within the specified warranty period. Stabilizer Solutions, Inc. does not warranty imitation "Stabilizer" purchased from a non-approved Stabilizer Solutions, Inc. licensee. Failures include, but are not limited to, the following:

1. Premature wear and tear, provide the material is maintained in accordance with manufacturer's written maintenance instructions.
2. Failure of system to meet performance requirements.

C. Warranty Period: Contractor shall provide warranty for performance of product. Contractor shall warranty installation of product for the time of one year from completion.

D. Contractor shall provide, for a period of sixty days, unconditional maintenance and repairs as required.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Stabilizer Solutions, 33 South 28th Street, Phoenix, AZ 85034, (800)336-2468, www.stabilizersolutions.com

2.02 MATERIALS

A. Stabilizer, by Stabilizer Solutions, stabilized decomposed granite system.

B. Decomposed granite. Comply with requirements of manufacturer of stabilizing solution.

1. Color: tan.
2. Sand and crushed stone shall consist of inert materials that are hard and durable, with stone free from surface coatings and deleterious materials. Gradation requirements shall be as follows:
3. Crushed Stone Sieve Analysis Percentage of Weight Passing a Square Mesh Sieve AASHTO T11-82 and T2782.

1/4" MINUS AGGREGATE GRADATION

U.S. Sieve No.	Percent Passing by Weight
# 3/8"	100
# 4	90 – 100
# 8	75 – 80

# 16	55 – 65
# 30	40 – 50
# 50	25 – 35
# 100	15 – 20
# 200 to	4. 10 – 15

PART 3 - EXECUTION

3.01 MANUFACTURERS CONSULTATION

A. Consult as necessary with manufacturer to provide an installation that is in accordance with manufacturer's specifications and recommendations. Manufacturer offers consulting services for installation techniques and support, contact manufacturer if desired.

3.02 EXAMINATION

A. Examine surfaces and grades for conformance and appearance before work begins.

B. Start of Work of this Section will indicate Contractor's acceptance of existing conditions.

3.03 PREPARE SUB-GRADE

A. Prepare sub-grade to compaction specified in the plans.

B. Conform to stabilized DG manufacturer's specifications or recommendations.

3.04 BLENDING STABILIZER

A. Blend in accordance with manufacturer's specifications.

3.05 PLACEMENT

A. After pre-blending, place the stabilized decomposed aggregate on prepared sub-grade. Level to desired grade and cross section.
   1. Provide crown as indicated in drawings.
   2. Provide cross slope to facilitate drainage to sides of pathways instead of down the length.

B. Depth of pathways – As indicated in the drawings.

3.06 WATERING

A. Water in accordance with manufacturer's specifications.

3.07 COMPACTION

A. Compact in accordance with manufacturer's recommended specifications for ADA surfacing.

B. Conform to drawings.

C. Take care in compacting decomposed granite when adjacent to planting and irrigation systems. Hand tamping with 8" or 10" hand tamp recommended

3.08 INSPECTION

A. Finished surface of pathway shall be smooth, uniform and solid. There shall be no evidence of chipping or cracking. Cured and compacted paving shall be firm throughout profile with no spongy areas. Loose material will not be present on the surface after installation, but may appear after use and according to environmental conditions. Paving should remain stable underneath the loose granite on top. It is a “natural” looking paving, yet stable throughout. Any significant irregularities in path surface shall be repaired to the uniformity of entire installation.

3.09 MAINTENANCE

A. Remove debris, such as paper, grass clippings, leaves or other organic material by mechanically blowing or hand raking the surface as needed. Any plowing program required during winter months shall involve the use of a rubber baffle on the plow blade or wheels on the plow that lifts the blade 1/4" off the paving surface.

B. During the first year, a minor amount of loose aggregate will appear on the paving surface (1/16” to 1/4"). If this material exceeds a 1/4", redistribute the material over the entire surface. Water thoroughly to the depth of 1”. Compact with power roller of no less than 1000 lbs. This process should be repeated as needed.

C. If cracking occurs, simply sweep fines into the cracks, water thoroughly and hand tamp with an 8” – 10” hand tamp plate.

D. Cure walkway annually with manufacturer’s recommended products and procedures.

3.10 REPAIRS

A. Repair in accordance with manufacturer’s recommended practices and procedures.

END OF SECTION

SECTION 32 16 00

CURBS, GUTTERS, SIDEWALKS, AND DRIVEWAYS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This Section includes exterior cement concrete pavement for the following.

1. Curbs
2. Curb and Gutter
3. Sidewalks
4. Dumpster pad
5. Driveways and ADA parking area

1.2 RELATED SECTIONS

1. Section 31 22 00 Grading
2. Section 32 11 23 Aggregate Base Course

1.3 REFERENCE STANDARDS

A. The term “State Standard Specifications” refers to the Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation (CALTRANS), latest edition. In case of conflict between the State Standard Specifications and these specifications, these specifications shall govern.

1. Any provisions for measurement and payment specified within the State Standard Specifications shall be disregarded and the provisions of this contract shall govern.

B. American Association of State Highway Transportation Officials (AASHTO) specifications.

C. American Concrete Institute (ACI): ACI 301 – Specifications for structural concrete for buildings.

D. American Society for Testing and Materials (ASTM): ASTM A185 – Welded Steel wire fabric for concrete reinforcement.

E. ASTM D1751: Performed expansion joint fillers for concrete paving and structural construction.

F. ASTM A615: Deformed and plain billet-steel for concrete reinforcement.

G. ASTM C2600: Air entraining admixtures for concrete.

H. ASTM C309: Liquid membrane forming compounds for curing concrete.

1.4 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.5 SUBMITTALS

A. The Contractor shall make all submittals in accordance with requirements in Division 01.

B. Product Data: For each type of manufactured material and product indicated, including reinforcement, and forming accessories, color admixtures, expansion joint systems, non-color and color curing agent, form release agent, and other, if requested by Owner's Representative.

C. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

D. Samples

1. Expansion Joint Filler Material: Submit one 12-inch length.

E. Laboratory test reports for evaluation of concrete materials and mix design tests.

F. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements.

1. Cementitious materials and aggregates.
2. Steel reinforcement, keyways, and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Bonding agent or adhesive.
6. Joint fillers.

G. Maintenance Data: Shall clearly describe type of cleaner and cleaning methods required to maintain completed concrete pavement.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

C. ACI Publications: Comply with ACI 301, "Specifications for Structural Concrete", unless modified by the requirements of the Contract Documents.

1.7 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

1.8 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 01.

1.9 SCHEDULING

A. Schedule work under the provisions of Division 01.

PART 2 PRODUCTS

2.1 FORMS

A. Form Materials: Wood, plywood, metal-framed plywood, or other acceptable panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
   1. Use flexible or curved forms for curves of 100 feet or less radius.

B. Form Release Agent: Provide commercial formulation form-release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 REINFORCEMENT MATERIALS

A. Reinforcing Bars and Tie Bars: ASTM 615, grade 60, deformed.

B. Plain, Cold-Drawn Steel Wire: ASTM A 82.

C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497.
   1. Furnish in flat sheets, not rolls.

D. Fabricated Bar Mats: Welded or clip-assembled steel bar mats, ASTM A 184. Use ASTM A 65, grade 60 steel bars, unless otherwise indicated.

E. Joint Dowel Bars: Plain steel bars, ASTM A 615, grade 60. Cut bars true to length with ends square and free of burrs.

F. Hook Bolts: ASTM A 307, grade A bolts, internally and externally threaded. Design hook bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

G. Supports for Reinforcement: Chairs, spacers, dowel bar supports and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Use wire bar type supports complying with Concrete Reinforcing Steel Institute specifications.
   1. Use supports with sand plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.

B. Conforming to Section 90-2 Minor Concrete of the State Standard Specifications.

C. Materials:
   1. Portland cement concrete shall conform to the provisions of Section 73 of the State Standard Specifications.
   2. Cementitious material shall conform to the provisions of Section 90-1.02B of the State Standard Specifications.

3. Aggregate shall conform to the provisions of Section 90-1.02C of the State Standard Specifications.
4. Water shall conform to the provisions of Section 90-1.02D of the Standard State Specifications.

2.4 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain no more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.

B. Form Release Agent: Non-staining material.

C. Chemical Admixtures: ASTM C 494, colored and water-reducing and/or retarding compatible, Type A or Type D, as required.

D. Curing Compounds for Concrete Paving: Clear, ASTM C 309, non-staining.

2.5 CONCRETE MIX

A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.
1. Do not use Owner's field quality-control testing agency as the independent testing agency.

C. Proportion mixes for curbs, gutters, sidewalks and driveways to provide concrete with the following properties.
a. Compressive Strength (56 Days): 5000 pounds per square inch.
b. Maximum Water-Cementitious Materials Ratio: 0.40.

D. Aggregate: 3/4" nominal maximum aggregate size according to ACI 318-14

E. Aggregate for exterior exposed concrete shall be uniformly graded 3/4" coarse aggregate per ASTM C33.

F. Concrete fibers: Macrosynthetic concrete fibers per ASTM 1116; Fibermesh® Sikafiber®-800 Stealth or approved equivalent; 3 pounds per cubic yard minimum; confirm fiber quantity per manufacturer recommendations.

G. Cementitious Materials: 7.1 sack mix with 25% fly ash. See ACI 318 Table 26.4.2.2(b) for limits of cementitious materials for concrete assigned to exposure Class F3.

H. The target air content shall be 5% with an actual value of 5% +/- 0.5%.

2.6 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.
1. When air temperature is between 85 degrees F and 90 degrees F, reduce mixing and delivery time for 1.5 hours to 75 minutes; when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

2.7 ACCESSORIES

A. Joint Sealer: State Standard Specifications, Section 51.

B. Tactile Warning Domes: Shall be precast concrete truncated dome tiles, color to be selected by Owner's Representative. TekWay Dome Tiles or Equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form release agent as required ensuring separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire fabric in lengths if practicable. Lap adjoining pieces at least 1 full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths if practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

F. Expansion Joint Dowel Bars: spaced horizontally a minimum of 12-inches on-center center in slab and parallel to edge of paving and each other. Dowels are to be not less than 6-inches from the edge of pavement.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.

1. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.

B. Construction Joints: Set construction joints at side and end terminations of paving, back of curbs and at locations where paving operations are stopped for more than 0.5 hour, unless paving terminates at expansion joints.

1. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving adjacent to curbs unless indicated.
2. Use epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Isolation Joints: Form isolation joints of pre-formed joint filler strips abutting concrete curbs, retaining and freestanding walls, ramps, stairs, catch basins, manholes, inlets, structures, building walls, walks, other fixed objects, and where indicated on the Drawings.

1. Locate expansion joints in pavement as detailed in the Drawings.
2. Install dowel bars and support assemblies at all expansion joints. Lubricate one-half of dowel length with heavy grease.
3. Locate expansion joints in curbs, curbs and gutters and concrete bands 25 feet on center to align with expansion joints in adjacent concrete paving, and in no case more than 40 feet on center.
4. Extend joint fillers full width and depth of joint.
5. Terminate joint filler not less than 0.5 inch below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is indicated.
6. Furnish joint fillers in one-piece. Where more than 1 length is required, lace or clip joint filler sections together.
7. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary pre-formed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Sawn Joints: construct after the concrete has hardened sufficiently that it will not be damaged by the sawing, but before shrinkage cracking can occur. The initial saw cut should be 0.125 inch to 0.25- inch in width.

1. At building walls, site walls, sign bases, and curbs, finish sawn cut with hand-held grinder or equal to extend cut or joint to face of vertical surface.

E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-third of the concrete thickness, as follows to match jointing of existing adjacent concrete pavement:

1. Locate score joints in pavement as detailed.
2. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

3. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
4. Locate score joints in curbs, curbs and gutters and concrete bands every 5-feet and align with score joints in adjacent concrete paving and in no case more than 10 feet on center.

F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 0.5-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Permit installation of other work.

B. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

C. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.

D. Do not add water to concrete during delivery or at Project site.

E. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

H. Screed paved surfaces with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutter: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

K. Cold-Weather Placement: Comply with provisions of ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 degrees F uniformly

heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F and not more than 80 degrees F at point of placement.

2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

L. Hot-Weather Placement: Place concrete complying with ACI 305R and as specified when hot weather conditions exist.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 degrees F. Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.

3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 CONCRETE FINISHING

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared, and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Paving: medium textured broom finish. Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

2. Bands: smooth form board with smooth trowel surface. After concrete has adequately cured strip formwork and apply smooth trowel texture on the top and exposed faces of the curb and band.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.

B. Protect surrounding areas, landscaping, and adjacent horizontal and vertical surfaces.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 CURING

A. Apply curing compound for non-colored cement concrete per manufacturer's instructions.

3.10 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows.

1. Elevation: 0.25 inch.
2. Thickness: Plus 0.375 inch, minus 0.25 inch.
3. Surface: Gap below 10 feet long, unleveled straightedge not to exceed 0.25 inch.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
5. Vertical Alignment of Tie Bars and Dowels: 0.25 inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 0.5 inch.
7. Alignment of Dowel-Bar End Relative to line Perpendicular to Pavement Edge: Length of dowel 0.25 inch per 12 inches.
8. Joint Spacing: 0.5 inch.
9. Score Joint Depth: Plus 0.25 inch, no minus.
10. Joint Width: Plus 0.125 inch, no minus.

3.11 FIELD QUALITY CONTROL TESTING

A. Testing Agency: The Owner will engage a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Section.

B. Testing Services: Testing shall be performed according to the following requirements.

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
2. Slump: ASTM C 143; 1 test at point of placement for each compressive-strength test but no less than 1 test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
3. Air Content: ASTM C 231, pressure method; 1 test for each compressive-strength test but no less than 1 test for each day's pour of each type of air-entrained concrete.
4. Concrete Temperature: ASTM C 1064; 1 test hourly when air temperature is 40 degrees F and below and when 80 degrees F and above, and 1 test for each set of compressive strength specimens.
5. Compression Test Specimens: ASTM C 31/C 31M; 1 set of 4 standard cylinders for each compressive-strength test, unless directed otherwise. Cylinders shall be molded and stored for laboratory cured test specimens unless field-cured test specimens are required.
6. Compressive-Strength Tests: ASTM C 39; 1 set for each day's pour of each concrete class exceeding 5 cu. yd. but less than 25 cu. yd., plus 1 set for each additional 50 cu. yd. Test 1 specimen at 7 days, test 2 specimens at 28 days, and retain 1 specimen in reserve for later testing if required.

C. When frequency of testing will provide fewer than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

1. When strength of field-cured cylinders is less than 85 percent of companion laboratory cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

2. Strength level of concrete will be considered satisfactory if averages of sets of 3 consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 pounds per square inch.

D. Test results will be reported in writing to Owner's Representative, concrete manufacturer, and Contractor within 24 hours of testing.

1. Reports of compressive strength tests shall contain the following.

a. Project identification name and number.

b. Date of concrete placement.

c. Name of concrete testing agency.

d. Concrete type and class.

e. Location of concrete batch in paving.

f. Design compressive strength at 28 days.

g. Concrete mix proportions and materials.

h. Compressive breaking strength, and type of break for both 7-day and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

F. Additional Tests: The testing agency will make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as requested by Owner's Representative. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as requested by Owner's Representative.

3.12 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section.

B. Drill test cores if requested by Owner's Representative when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 32 17 26

TACTILE WARNING SURFACING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Embedded tactile warning surface tile, with an inline dome pattern, for application on ramps and level walking surfaces.

B. Tactile Tile Installation Method: As indicated on Drawings, and as follows:

1. New Concrete: Installation in cast-in-place uncured (wet) concrete.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. AASHTO HB-17 – Standard Specifications for Highway Bridges.
2. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.
3. ASTM C293 – Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading).
4. ASTM C1028 – Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
5. ASTM D543 – Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
6. ASTM D570 – Standard Test Method for Water Absorption of Plastics.
7. ASTM D638 – Standard Test Method for Tensile Properties of Plastics.
8. ASTM D695 – Standard Test Method for Compressive Properties of Rigid Plastics.
9. ASTM D1037 – Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.
10. ASTM D2486 – Standard Test Methods for Scrub Resistance of Wall Paints.
11. ASTM D5420 – Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).
12. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

13. ASTM G155 – Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Show detailed plans of tile profile, fastener locations, and installation methods.

C. Samples: Furnish two tile samples, minimum 8 inches by 8 inches in size, of the type and color specified in this Section.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section with a minimum five years' experience.

1.6 REGULATORY REQUIREMENTS

A. General: Provide detectable (tactile) warning products in accordance with California Code of Regulations (CCR). Title 24, Part 1, 2022 California Administrative Code, Chapter 5 "Access to Public Buildings by Persons with Disabilities".

1. Article 3 "Acceptance of Detectable Warning and Directional Surface Products for Manufacturers and Design Professionals".
2. Article 4 "Application for Independent Entity Evaluation Approval (IEEA)".

B. Definition of Detectable Warning: Conform to 2022 California Building Code, Chapter 2 "Definitions", Section 202, "Definitions".

1. Chapter 11B "Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing," Section 11B-106.5 "Defined Terms" for detectable warning.

C. Detectable Warnings for Site Accessibility: Provide detectable warning system in accordance with 2022 California Building Code, Chapter 11B, "Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing", Section 11B-705.1, Section 11B-705.1.1.4, and the following:

1. Detectable Warnings at Curb Ramps: Chapter 11B, Section 11B-206 "Accessible Routes", Section 11B-406.5.12, "Detectable Warnings", and Section 11B-705.1.2.2, "Curb Ramps".
2. Detectable Warnings at Hazardous Vehicular Areas: Chapter 11B, Section 11B-206, "Accessible Routes", Section 11B-406.5.12, "Detectable Warnings", and Section 11B-705.1.2.5, "Hazardous Vehicular Areas".
3. Detectable warning surfaces shall differ from adjoining surfaces in resiliency or sound-on-cane contact per Section 11B-705.1.1.4.
4. Dome size and spacing shall comply with Chapter 11B, Section 11B-705.1.1.1 and Section 11B-705.1.1.2.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle packaged products in original containers with seals unbroken and labels intact until the time of installation.

B. Store delivered products in a clean, safe, dry area.

1.8 WARRANTY

A. Five years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of Design: Engineered Plastics Inc., Williamsville, NY; 800-682-2525, http://www.armor-tile.com. Product:

1. Cast-In-Place Type Armor-Tile for embedding in cast-in-place uncured (wet) concrete.

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Tactile Warning Tiles: An epoxy polymer composite with an ultraviolet stabilized coating containing aluminum oxide particles in the truncated domes.

1. Cast-In-Place Type Tile for Embedding in Cast-In-Place Uncured (Wet) Concrete:

a. Tile thickness to be 0.3875 inch at domes and 0.1875 inch in flat areas between domes. Total thickness at perimeter to be 1.375 inches; dome height to be 0.20 inch.

b. Tile underside to have embedment flanges with 0.625-inch diameter holes; long sides to have 0.1875-inch diameter vent holes.

c. Tile to have sound amplifying plastic plates attached between flanges, with an air space between tile bottom surface and sound amplifying plastic plates.

d. Tile face to have non-slip texture.

B. Color and Size:

1. Safety Yellow, (Federal Color #33538 of Federal Standard 595A) colorfast, UV stabilized coating. Color shall be uniform throughout the tile.

2. Sizes: As indicated on Drawings.

C. Performance Requirements: Tactile warning tiles shall meet or exceed the following criteria:

1. Water Absorption: 0.05 percent, maximum, when tested in accordance with ASTM D570.

2. Slip Resistance: 0.80, minimum combined wet/dry static coefficient of friction on top of domes and field area, when tested in accordance with ASTM C1028.

3. Compressive Strength: 28,000 psi, minimum, when tested in accordance with ASTM D695.

4. Tensile Strength: 19,000 psi, minimum, when tested in accordance with ASTM D638.

5. Flexural Strength: 25,000 psi, minimum, when tested in accordance with ASTM C293.

6. Gardner Impact: 550 inch-pounds per inch minimum, when tested in accordance with ASTM D5420.

7. Chemical Stain Resistance: No discoloration or staining when exposed to ten percent hydrochloric acid, urine, saturated calcium chloride, black stamp pad ink, chewing gum, red aerosol paint, ten percent ammonium hydroxide, one percent soap solution, turpentine, five percent Urea, diesel fuel, motor oil, and tested in accordance with ASTM D543.

8. Wear Depth: 0.06 inch, maximum, after 1000 abrasion cycles of 40 grit Norton Metallite sandpaper, tested in accordance with ASTM D2486.
9. Flame Spread: 15 maximum, when tested in accordance with ASTM E84.
10. Accelerated Weathering: No deterioration, fading or chalking, when tested for 3,000 hours in accordance with ASTM G155.
11. Accelerated Aging and Freeze Thaw Test of Tile and Adhesive System: No cracking, delamination, warping, checking, blistering, color change, loosening of tiles, or other detrimental defects, when tested in accordance with ASTM D1037.
12. Salt and Spray Performance: No evidence of deterioration or defects after 200 hours of exposure, when tested in accordance with ASTM B117.
13. AASHTO HB-17 Single Wheel HS20-44 Loading Test for Cast-In-Place Type Tile: Mounted on concrete platform with 1/2 inch air space at the underside of tile and subjected to a maximum load of 10,400 pounds, corresponding to 8000 pound individual wheel load and thirty percent impact factor; no visible damage at maximum loading.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install tactile warning surface tiles in accordance with manufacturer's printed instructions.

B. Install Cast-In-Place Type tiles over cast-in-place, uncured (wet) concrete.

C. Ensure that the surfaces being prepared and fabricated to receive the tiles are constructed correctly and adequately for tile installation.

D. Installation in Cast-In-Place Uncured (Wet) Concrete: Maintain concrete in 4 inch to 7 inch slump range. Lay tactile warning surface tiles (without removing protective plastic wrap) in uncured (wet) concrete and tamp each tile in place. Place weights over tiles to prevent floating, as recommended by the manufacturer. After curing, remove protective plastic wrap, and clean tile surfaces.

END OF SECTION

SECTION 32 23 16.13

TRENCHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Trenching for site utilities.

B. Backfilling and compacting for utility trenches.

1.2 RELATED SECTIONS

A. Section 31 22 00 – Grading

B. Section 33 11 16 – Site Water Utility Distribution Piping

C. Section 33 31 00 – Sanitary Utility Sewerage Piping

D. Section 33 42 11 – Stormwater Gravity Piping

1.3 REFERENCE STANDARDS

A. Geotechnical Investigation - See Information Available to Bidders.

B. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2002.

D. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

E. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

F. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2005.

1.4 QUALITY ASSURANCE AND CONTROL

A. Perform work in accordance with Mono County Standards and Caltrans Standard Specifications.

B. Perform work in accordance with Mono County standards.

1.5 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where approved by the County's Construction Manager.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
2. Prevent contamination.

3. Protect stockpiles from erosion and deterioration of materials.

1.6 SCHEDULING

A. Schedule work under the provisions of Division 01.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. General Fill - Fill Type General Backfill: Subsoil excavated on-site.

B. Bedding: Class II per ASTM D2331.

C. Haunching and Initial Backfill: Class II per ASTM D2331.

2.2 SOURCE QUALITY CONTROL

A. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

B. If tests indicate materials do not meet specified requirements, change material and retest.

C. Provide material of each type from same source throughout the work.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that survey benchmarks and intended elevations for the work are as indicated on Contract Drawings.

B. Protect plants and other features to remain.

C. Protect benchmarks, survey control points, existing structures, fences, and paving from excavating equipment and vehicular traffic.

3.2 TRENCHING

A. Notify Owner’s Representative of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

G. Remove lumped subsoil, boulders, and rock.

H. Remove excavated material that is unsuitable for re-use from site.

I. Stockpile excavated material to be re-used on site in accordance with Section 31 22 00, Grading.

J. Remove excess excavated material from site.

3.3 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.4 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Fill up to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement.

1. Do not fill over porous, wet, frozen, or spongy subgrade surfaces.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

H. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise.

1. Make gradual grade changes.
2. Blend slope into level areas.

I. Correct over-excavated areas

1. Thrust bearing surfaces: Fill with concrete.
2. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.

J. Compaction Density unless Otherwise Specified or Indicated

1. Under paving, slabs-on-grade, and similar construction: 95 percent of maximum dry density.
2. Landscaped areas: 90 percent of maximum dry density.

K. Reshape and re-compact fills subjected to vehicular traffic.

3.5 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Utility Piping

1. Bedding: Class II.
2. Cover with general fill.
3. Fill up to subgrade elevation.
4. Compact in maximum 8-inch lifts to 95 percent of maximum dry density.

3.6 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevation.

B. Top Surface of Backfilling under Paved Areas: Plus or minus 1 inch from required elevations.

3.7 FIELD QUALITY CONTROL

A. Perform compaction density testing on compacted fill in accordance with ASTM D2922.

B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor").

C. If tests indicate work does not meet specified requirements, remove work, replace, and retest.

D. Frequency of Tests: 1 test per 300 linear feet of trench.

3.8 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition.

B. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 32 31 00

STRUCTURAL CANTILEVER SLIDE GATE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. All labor, materials, equipment and appliances necessary to complete all cantilever slide gates and operators required for this project in strict accordance with this Section and Drawings.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Division 26 – Electrical.

C. Division 28 – Electronic Safety And Security.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM A53/A53M – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM A121 – Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.
3. ASTM F1184 – Standard Specification for Industrial and Commercial Horizontal Slide Gates, Type II, Class 2.
4. ASTM F2200 – Standard Specification for Automated Vehicular Gate Construction.
5. AWS D1.2 – Structural Welding Code - Aluminum.
6. UL 325 – ANSI/CAN/UL Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.4 SUBMITTALS

A. Product Data:

1. Provide manufacturer’s catalog cuts with printed specifications and installation instructions.
2. If operated gate system, furnish two copies of operation and maintenance data covering installed products.

B. Shop Drawings:

1. Provide shop drawings showing the gate system, including details of all major components.
2. Provide complete details of gate construction, gate height, and post spacing dimensions.

C. Certification of Performance Criteria:

1. Manufacturer of gate system shall provide certification stating the gate system includes the following material components that provide superior performance and longevity. Alternate designs built to minimum standards that do not include these additional structural features shall not be accepted.
    a. Gate track system shall be keyed to interlock into gate frame member providing 200 percent additional strength when compared to weld only keyless systems. When interlocked with and welded to the "keyed" frame top member, gate track forms a composite structure.
    b. Gate shall have a minimum counterbalance length of 50 percent opening width which provides a 36 percent increase in lateral resistance when compared to ASTM minimum of 40 percent counterbalance. If gate is ever to be automated, counterbalance section shall be filled with fabric or other specified material.
    c. To provide superior structural integrity, intermediate vertical members shall be used - with spacing between verticals to be less than 50 percent of the gate frame height.
    d. Entire gate frame including counterbalance section shall include two adjustable stainless or galvanized steel cables, minimum 3/16 inch, per bay to allow complete gate frame adjustment, maintaining strongest structural square and level orientation.
    e. Gate truck assemblies shall be tested for continuous duty and shall have precision ground and hardened components. Bearings shall be pre-lubricated and contain shock resistant outer races and captured seals.
    f. Gate truck assemblies shall be supported by a minimum 5/8 inch plated steel bolt with self aligning capability, rated to support a 2,000 pound reaction load.
    g. Hanger brackets shall be hot dipped galvanized steel with a minimum 3/8 inch thickness that is also gusseted for additional strength.
    h. Gate top track and supporting hangar bracket assemblies shall be certified by a licensed professional engineer to withstand a 2,000 pound vertical reaction load without exceeding allowable stresses.

D. Certifications:

1. Gate shall be in compliance with ASTM F2200, Standard Specification for Automated Vehicular Gate Construction.
2. If operated gate system, gate operator shall be in compliance with UL 325
    a. UL listing label shall be affixed to gate operator.
3. Gate manufacturer shall provide independent certification as to the use of a documented Welding Procedure Specification and Procedure Qualification Record to ensure conformance to the AWS D1.2 welding code. Individual Certificates of Welder Qualification documenting successful completion of the requirements of the AWS D1.2 code shall also be provided.
4. Manufacturer shall supply certification that gate design performance meets requirements of this Section.

1.5 WARRANTY

A. The truck assembly shall be warranted against manufacturing defects by the manufacturer for a period of five years from date of Project Completion.

B. The gate operator shall be warranted against manufacturing defects by the manufacturer for a period of five years from date of Project Completion.

PART 2 PRODUCTS

2.1 CANTILEVER SLIDE GATE MANUFACTURERS:

A. Acceptable Manufacturers:

1. Tymetal Corp., Greenwich, NY; 800-328-4283, www.tymetal.com. Products:

a. Gate: Fortress Structural Cantilever Slide Gate.

b. Operator: Model No. TYM-HYD VF3 Hydraulic Slide Gate Operator with Smart Touch Controller.

B. Substitutions: Under provisions of Division 01.

2.2 GATE DIMENSIONS

A. Gate dimensions shall be as shown on the Drawings.

2.3 GATE CONSTRUCTION DETAILS

A. Gate Frame:

1. The gate frame shall be fabricated from 6063-T6 aluminum alloy extrusions. The top member shall be a 3 inch x 5 inch aluminum structural channel/tube extrusion weighing not less than 3.0 pounds per linear foot. To maintain structural integrity this frame member shall be "keyed" to interlock with the "keyed" track member. If fabricated as a single horizontal piece, the bottom member shall be a 2 inch x 5 inch aluminum structural tube weighing not less than 2.0 pounds per linear foot. If fabricated in two horizontal pieces, the bottom member shall be a 5 inch aluminum structural channel weighing not less than 2.65 pounds per linear foot, and the two horizontal pieces or sections shall be spliced in the field. The gate frame shall be fabricated in one or multiple sections depending on size requirements or project constraints.

B. Vertical Members:

1. The vertical members at the ends of the opening portion of the frame shall be "P" shaped in cross section with a nominal base dimension of no less than 2 inches x 2 inches and weighing not less than 1.6 pounds per linear foot. Major 2 inch x 2 inch vertical members weighing not less than 1.1 pounds per linear foot shall separate each bay and shall be spaced at less than gate height intervals.

2. Intermediate 1 inch x 2 inch vertical members weighing not less than 0.82 pounds per linear foot shall alternate between the 2 inch x 2 inch major members.

C. Gate Track:

1. The gate frame shall have separate semi-enclosed “keyed” tracks, extruded from 6005A-T61 or 6105-T5 aluminum alloy, weighing not less than 2.9 pounds per linear foot. Track members shall be located on each side of the top member. When interlocked and welded to the “keyed” top member, it shall form a composite structure with the top of the gate frame. Welds shall be placed alternately along the top and side of the track at 9 inch centers with welds being a minimum of 2 inches long.

D. All welds on the gate frame shall conform to Welding Procedure Specification and Procedure Qualification Record to ensure conformance to the AWS D1.2 Structural Welding Code.

E. Gate Mounting:

1. The gate frame is to be supported from the track by four swivel type, self-aligning, 4-wheeled, sealed lubricant, ball-bearing truck assemblies.
2. The bottom of each support post shall have a bracket equipped with a pair of 3 inch diameter UHMW guide wheels Wheel cover protectors shall be included with bottom guides to comply with UL325.
3. Gap protectors shall be provided and installed, compliant with ASTM F2200.

F. Diagonal "X" bracing of 3/16 inch or 1/4 inch diameter stainless or galvanized steel cable shall be installed throughout the entire gate frame.

G. The gate shall be completed by installation of approved filler as specified.

1. Chain Link:
   a. 2 inch x 2 inch x 9 gauge aluminized steel chain link fabric shall extend the entire length of the gate.
   b. Fabric shall be attached at each end of the gate frame by standard fence industry tension bars and tied at each 2 inch x 2 inch vertical member with standard fence industry ties.
      1) ASTM F2200 requires attachment method that leaves no leading or bottom edge protrusions; cannot exceed 0.5 inch.
   c. At operated gate, counterbalance shall also have fabric to prevent reach through and comply with ASTM F2200.
   d. Anti-Climb Wire Mesh: 1/2 inch square x 11 gauge galvanized wire mesh installed over 2 inch diamond mesh on secure side of gate from mid rail to top rail to prohibit climbing.

2.4 POSTS

A. Double sets of support posts shall be minimum 6.625 inch outside diameter round Schedule 80 XS galvanized steel pipe in conformance with ASTM A53/A53M.

B. Gate posts shall be galvanized and set in concrete footings as shown on Drawings.

2.5 ACCESSORIES

A. Barbed Wire: ASTM A121; 12.5 gauge strands; 14 gauge four point round barbs, 5 inch spacing, Class 3 zinc coating.

B. Extension Arms: 14 inches long with slits at even spacing for three strands barbed wire. Extension arms shall be welded to top of gate frame. Extension arms shall be solid one-piece construction non-breakaway type.

2.6 FINISH

A. Gate shall be mill finish aluminum. If powder coated, the gate, including track member, and all accessories shall be pretreated chemically by sand blasting or other acceptable method to ensure proper coating adherence.

2.7 GATE OPERATOR

A. Operator Characteristics:
   1. Type: Variable frequency drive.
   2. Duty: Continuous.
   3. Pump motor: Shall be a 2 HP, 56C, TEFC, three phase, continuous duty motor, with a service factor of 1.15, or greater.
   4. Speed: 36 inches per second.
   5. Ultra soft start.
   6. Soft stop.
   7. Brake valves.
   8. Drawbar Pull: 300 pounds.
   9. Weight Capacity: 5,000 pounds.
   10. Drive Wheels: Two 8 inch diameter drive wheels. All wheels must be covered.
   11. Audio alarm which warns a minimum of three seconds before operation.
   12. UL 325 Vehicular Usage Class: III, IV.
   13. Controls: Smart Touch Controller Board with 256K memory containing:
      a. Inherent entrapment sensor;
      b. Built in “warn before operate” system;
      c. Built in timer to close;
      d. Liquid crystal display for system configuration and reporting of control status;
      e. 23 programmable output relay options;
      f. Anti-tailgate mode;
      g. Built-in power surge/lightening strike protection;
      h. Menu configuration, event logging and system diagnostics are easily accessible with a PC and free START software;
      i. RS232 port for connection to laptop or other computer peripheral and RS485 connection of Master/Slave systems.
   14. Transformer: 75 VA, non-jumpered taps, for all common voltages.
   15. Control circuit: 24VDC.
   16. Power: 208 VAC single phase, 60 Hertz.
   17. All components shall have overload protection.

B. Entrapment Protection:

1. Gate edge contact type reversing sensors on leading edge and trailing edge of gate. Edge sensors shall be placed not higher than 6 inches above the ground.
2. Non-contact type thru-beam photoelectric sensors for both directions on each side of gate. Lower photo eyes shall be mounted approximately 15 inches to 30 inches above the ground and as close to the gate as possible. Upper photo eyes shall be mounted approximately 55 inches above the ground and as close to the gate as possible.
3. Gate entrapment devices shall be in conformance with UL 325.
    a. A hardwired contact sensor shall be located, and its' wiring arranged, so that the communication between the sensor and the gate is not subjected to mechanical damage.
    b. A contact sensor that transmits its' signal to the gate operator shall be located such that the signal is not impeded by building structures or other obstructions and shall function under its' intended end-use conditions.
    c. The contact and non-contact sensors must be tested and labeled as "Recognized Components" under the UL 325 standard in order to be deemed acceptable for use in this application.
    d. Provide warning signs on both sides of gate.

PART 3 EXECUTION

3.1 EXAMINATION

A. Final grades and installation conditions shall be examined. Installation shall not begin until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Gate assembly shall be installed in strict accordance with the manufacturer's printed instructions and as indicated on Drawings.

B. The gate and installation shall conform to ASTM F1184 standards for aluminum cantilever slide gates, Type II, Class 2.

C. The gate and installation shall comply with ASTM F 2200 and UL 325.

1. Automated / operated vehicular gates shall not be used for pedestrian traffic.

D. Coordinate with the installation of the gate operator.

3.3 SYSTEM VALIDATION

A. The complete system shall be adjusted to assure it is performing properly.

B. The system shall be operated for a sufficient period of time to determine that the system is in proper working order.

C. Provide testing and training for gate systems as follows:

1. Provide manufacturer's printed instructions for each component of the gate system including, but not limited to, mechanical components, safety devices and the gate operator.

2. Gate operator warning signs shall be installed in prominent position on both sides of the gate.
3. Provide safety training to Owner regarding the safety points including, but not limited to, the basic operational guidelines of the safety features of the gate operator system as listed in the gate operator manual.

END OF SECTION

SECTION 32 31 13.53

HIGH–SECURITY CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Chain link fence framework, fabric, and accessories.

B. Barbed wire.

C. Vinyl privacy slats.

D. Excavation and foundation for posts.

E. Swinging gates and related hardware.

1.2 RELATED SECTIONS

A. Section 03 20 00 – Concrete Reinforcing.

B. Section 03 30 00 – Cast-In-Place Concrete.

C. Section 08 71 00 – Door Hardware: Gate hardware.

D. Section 11 98 14 – Detention Door Hardware: Gate hardware.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards and Manuals:

1. ASTM A121 – Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.
2. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
3. ASTM A392 – Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
4. ASTM A1011/A1011M – Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
5. ASTM F567 – Standard Practice for Installation of Chain-Link Fence.
6. ASTM F626 – Standard Specification for Fence Fittings.
7. ASTM F900 – Standard Specification for Industrial and Commercial Swing Gates.

8. ASTM F1083 – Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
9. ASTM F1916 – Standard Specifications for Selecting Chain Link Barrier Systems With Coated Chain Link Fence Fabric and Round Posts for Detention Applications.
10. ASTM F3000 – Standard Specification for Privacy Insert Slats for Chain Link Fabric and Privacy Chain Link Fabric Manufactured Containing Pre-Installed Privacy Slats.
11. CLFMI Product Manual.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data: Submit data on fabric, posts, accessories, fittings, and hardware.

C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware, anchorage, gates, and schedule of components.

D. Samples: Submit two 12 inch long samples of vinyl slats in selected color.

E. Quality Assurance/Control Submittals:
1. Manufacturer's qualifications information.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section with a minimum five years documented experience. Submit list of past detention or correctional projects (minimum five projects) including contact information.

B. Pre-Installation Meetings:
1. Conduct pre-installation meeting in accordance with Division 01.
2. Convene pre-installation meeting one week prior to commencing work of this Section.
3. Coordinate work in this Section with work in related Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Packaging: Final gate assemblies shall be wrapped in protective material or crated to provide adequate protection during shipment.

C. Storage and Protection: Store materials elevated from the ground and covered/protected from the weather, adequately ventilated.

PART 2 PRODUCTS

2.1 MATERIALS

A. Conform to ASTM F1916 and to CLFMI Product Manual.

B. Framework:

1. Round Pipe: CLFMI Type I or Type II.
2. Type I: ASTM F1083, standard weight (Schedule 40), plain ends.
3. Type II: ASTM A1011/A1011M structural steel minimum yield strength 50,000 psi; cold formed, electric welded.
4. Zinc Coating: Hot-dipped conforming to ASTM A123/A123M minimum 1.8 ounces per square foot.
5. Dimensions and Weights:

Outside Diameter (inch)	Type I Weight (lbs/ft)	Type II Weight (lbs/ft)
2.375	3.65	3.12
2.875	5.79	4.64
4.000	9.11	6.56
6.625	17.97	-
8.625	28.55	-

6. Terminal Posts (End, Corner, and Angle Posts)
   a. Minimum 6.625 inch outside diameter.
7. Intermediate Posts:
   a. Minimum 4.000 inch outside diameter.
8. Gate Posts: Type I Pipe; minimum 4.000 inch outside diameter where gate leaf width is 6 feet or less and fabric height of fence and gate leaf extends 12 feet or less above finish grade; minimum 6.625 inch outside diameter up to 10 feet wide and 8.625 inch outside diameter for gates larger than 10 feet wide.
9. Rails and Braces: 2.375 inch outside diameter.

C. Fabric:

1. ASTM A392; Class 2 zinc coating.
2. Standard Wire Mesh: 2 inch diamond mesh, No. 9 gauge wire.
3. Knuckled bottom selvage; twisted and barbed top selvage except knuckled top selvage where indicated.

D. Barbed Wire: ASTM A121; 12.5 gauge strands; 14 gauge four point round barbs, 5 inch spacing, Class 3 zinc coating.

E. Bottom Rail Anchors: No. 3 galvanized reinforcing bars, U-shaped with hooks on each end.

F. Concrete: As specified in Section 03 30 00.

G. Concrete Reinforcing Bars: As specified in Section 03 20 00.

2.2 ACCESSORIES

A. General: Malleable steel, cast iron, or pressed steel conforming to ASTM F626; hot-dipped galvanized, minimum 1.8 ounces per square foot

B. Tension (Stretcher) Bars: One-piece lengths equal to full height of fabric with a minimum cross-section of 1/4 inch by 3/4 inch.

C. Tension (Stretcher) Bar Bands: Steel, 3/4 inch x 1/10 inch nominal to secure tension bars to posts.

D. Extension Arms: 14 inch long with slits at even spacing for three strands barbed wire, extending at a 45 degree angle inside of the fence line. Extension arms shall have a tight press-fit or should be tack welded. Extension arms shall be solid one-piece construction non-breakaway type.

E. Post Tops: Pressed steel, or malleable iron, designed as a weather tight closure cap for tubular post. Provide one cap for each exposed tubular post end, unless equal protection is afforded by combination post top cap and barbed wire supporting arm where barbed wire or barbed tape is required.

F. Truss Assembly: Capable of withstanding 2,000 pounds tension; consisting of minimum 1/2 inch truss rod with truss tightener or turnbuckle.

G. Boulevard Clamps: Two piece clamp, minimum 12 gauge, with 5/16 inch carriage bolts and nuts.

H. Braces: Same material as the rails extending from the terminal, corner, or pull post to the first adjacent intermediate post. Securely fasten braces to posts by heavy pressed steel and malleable fittings (minimum 12 gauge), then securely trussed from intermediate post to base of terminal post with a 3/8 inch truss rod equipped with a galvanized turnbuckle.

I. Rail Ends: Weathertight closure for tubular rails and braces.

J. Hog Rings: 9 gauge galvanized steel.

K. Tie-Wire: 6 gauge galvanized steel wire.

L. Vinyl Privacy Slats:

1. Winged Slat as manufactured by SlatSource/PrivacyLink, Pexco PDS Fence Products or accepted equal, with the following characteristics:

   a. Material: ASTM F3000 extruded high-density polyethylene with color pigments and ultraviolet inhibitors.

   b. Configuration: Rigid, flat-tubular body with internal supports and flexible, resilient, serrated wings on each side of slat body; slats shall be self-locking.

   c. Color: As selected by Architect from full range of manufacturer's standard colors.

2.3 SWINGING GATES

A. Framework: Conform to ASTM F900.

1. Gate Frames: Type I pipe members, 2.375 inch outside diameter up to 10 foot wide leaf, unless otherwise indicated.

2. Provide truss rods of 3/8 inch minimum nominal diameter to prevent sag or twist.

3. Provide intermediate bracing of gate leaves, spaced so that members are no more than eight feet apart.

4. Provide horizontal gate leaf braces as required to provide rigid construction, free from sag or twist.

5. Gate Fabric: Match fence fabric.
6. Attach fabric to frame at intervals not exceeding 12 inches. Secure with tension bars, tension bands, and 6 gauge steel wire.

B. Gate Hardware:

1. Refer to Section 08 71 00 and Section 11 98 14.
2. General: Malleable steel, cast iron, or pressed steel conforming to ASTM F626; hot-dipped galvanized, minimum 1.8 ounces per square foot.
3. Gate Hinges: Heavy duty and appropriately sized for the supported gate with large bearing surfaces for clamping position. Hinges shall not twist or turn under the action of the gate. Gates shall be easily operable by one person. Malleable iron, ball-and-socket type; non-lift-off type, offset to permit 180 degree swing.
4. Latch:
   a. At pairs of gates provide forked type capable of retaining gate in closed position and have provision for padlock. Latch shall permit operation from either side of gate.
   b. At single gates: Provide positive fork latch with provisions for padlocking.
5. Keeper: Provide automatically engaging keeper for each gate leaf, holding it in the open position until manually released.
6. Double leaf gates: Provide gate stops for all double gates, consisting of mushroom type or flush plate with anchors. Set in concrete to engage the center drop rod or plunger.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions. Verify grade provides flat surface allowing fence construction with gap no more than 1-1/2 inches between bottom of rail and the grade beam or finish grade.

B. Report unacceptable conditions to the Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 POST SPACING, HOLE DIAMETER, AND SETTING DEPTH

A. General: Conform to ASTM F567.

B. Space intermediate posts equidistant at intervals not exceeding ten feet.

C. Set terminal posts (end, corner, and gate) at the beginning of each continuous length of fence and at abrupt changes in vertical and horizontal alignments.

D. Set posts in concrete in holes of minimum diameter and depth as follows:

1. Minimum intermediate post hole diameters and setting depths:

Pipe Outside Diameter (inch)	Post Hole Diameter (inch)	Setting Depth (inch)
4.0	18.0	42.0
6.625	24.0	48.0

2. Minimum terminal/corner post hole diameters and setting depths:

Pipe Outside Diameter (inch)	Post Hole Diameter (inch)	Setting Depth (inch)
4.0	24.0	42.0
6.625	24.0	48.0

3. Minimum gate post hole diameters and setting depths:

Pipe Outside Diameter (inch)	Post Hole Diameter (inch)	Setting Depth (inch)
4.0	24.0	42.0
6.625	24.0	48.0

3.3 INSTALLATION

A. Install in accordance with ASTM F567, manufacturer's printed instructions, and approved shop drawings.

B. Install units plumb, level, and square, and free from warp or twist while maintaining dimensional tolerances and alignment with adjacent surfaces.

C. Set intermediate, terminal and gate posts plumb in concrete footings with top of footing flush with grade beam and finish grade, as indicated on Drawings.

D. Brace each gate and corner post to adjacent intermediate post with horizontal center brace rail and diagonal truss rods. Install brace rail, one bay each side from terminal and gate posts.

E. Provide top rail through intermediate post tops and splice with 6 inch long rail sleeves. Top rails shall be continuous, using 18 foot minimum lengths, except at corner and gate posts.

F. Install center and bottom brace rail on corner gate leaves.

G. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

H. Position bottom of fabric 1-1/2 inch maximum above grade beam and finish grade.

I. Fasten fabric to top rail, intermediate posts, braces and bottom rail with tie wire at maximum 15 inch on centers.

J. Attach fabric to terminal and gates posts with tension bars and tension bar clips.

K. Do not swing gates from building wall; provide gate posts.

L. Install gates with fabric to match fence. Install a minimum of three hinges per leaf, and all other gate hardware specified in Section 08 71 00 and Section 11 98 14.

M. Install extension arms and barbed wire along top of fence.

N. Install vinyl slats per manufacturer's recommendations and in a vertical direction, securely locked in place.

3.4 ERECTION TOLERANCES

A. Maximum variation from plumb: 1/4 inch.

B. Maximum offset from true position: 1 inch.

C. Components shall not infringe adjacent property lines.

3.5 ADJUSTING

A. Adjust parts for smooth, uniform operation.

B. Lubricate hardware and other moving parts.

END OF SECTION

SECTION 32 80 00

IRRIGATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pipe and fittings, valves, sprinkler heads, and accessories.

B. Control system.

C. Backflow Prevention System.

1.02 RELATED SECTIONS

A. Section 33 11 16 - Water Distribution: Water service and additional materials.

B. Section 32 90 00 - Planting: Coordination with fine grading and soil preparation.

C. Section 31 22 19 – Finish Grading

1.03 MEASUREMENT AND PAYMENT

A. Measurement and Payment for Work of this Section shall be as indicated in the General Conditions.

1.04 REFERENCES

A. ASTM A53: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

B. ASTM D1784 - Specification for Rigid PVC Compounds and CPVC Compounds.

C. ASTM D1785 - Standard Specification for PVC Plastic Pipe, Schedules 40, 80, and 120.

D. ASTM D 2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2004b.

E. ASTM D2464 - Standard Specification for Threaded Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80

F. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

G. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

H. ASTM D 2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2004.

I. ASTM D3139 - Joints for Plastic Pressure Pipe Using Flexible Elastomeric Seals.

J. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

K. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe

L. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2003.

1.05 DEFINITIONS

A. Extra Wire: Control wire that is intended for future valve.

B. Lateral Line: Pipe downstream of zone valve.

C. Mainline: Pipe from backflow device to zone valves.

D. Spare Control Wire: Control wire that is intended as a backup in case of faults or unknown conditions.

1.06 SYSTEM DESCRIPTION

A. Contractor shall provide and install a complete irrigation system with the intent of the Drawings and Specifications. System shall provide 100% coverage to all planted areas in a uniform manner.

1.07 SUBMITTALS

A. See Section 01 33 00 - Submittals, for submittal procedures.

B. Shop Drawings: Prepare and submit the following fully dimensioned and labeled:

1. POC Connection enclosure including all appurtenances and equipment, to scale of detail not less than 1” =10’.
2. Backflow prevention assembly.
3. Controller assemblies including electrical.
4. Layout plan for controller area.

C. Product Data: Provide for all components incorporated into the Work and as requested to illustrate compliance with the Project Documents.

D. Samples: Provide as requested.

E. Test Reports as described in Part 3.

F. Record Documents: Record actual locations of all concealed components, piping system, conduit, and other items listed below. Dimension from two permanent points of reference, building corners, sidewalk, or road intersections, etc., the location of the following items:

1. Connection to existing water lines.
2. Connection to existing electrical power.
3. Modifications to existing system.
4. Gate valves.
5. Routing of main line indicating all changes in direction and points along straight runs at intervals no more than 100'.

6. Sprinkler control valves.
7. Routing of control wiring.
8. Quick coupling valves.
9. Other related equipment as directed by the Landscape Architect.

G. Controller Charts: Provide color coded diagram of irrigation system as follows:
1. Prepare at a scale that will fit inside of controller door or in standard size 3-ring binder or spiral bound as directed by Owner.
2. Scale shall be legible and no less than 1" = 50'. Use multiple pages as required.
3. Laminate all sheets with minimum 10 mil. plastic.
4. Submit and obtain approval of Landscape Architect prior to requesting final observation of irrigation system.

H. Operation and Maintenance Data:
1. Provide instructions for operation and maintenance of system and controls, seasonal activation and shutdown, and manufacturer's parts catalog.
2. Provide schedule indicating length of time each valve is required to be open to provide a determined amount of water.

1.08 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years of experience.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's instructions and requirements.

B. Coordinate on-site storage with Owner.

C. Handling of PVC Pipe and Fittings: Exercise care in handling, loading, unloading, storing and installation of PVC pipe and fittings. All PVC pipe shall be transported in a vehicle that allows the length of pipe to lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has been dented or damaged will be discarded and, if installed, shall be replaced with new piping.

1.10 PROJECT CONDITIONS

A. The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the Landscape Architect. In the event this notification is not performed, the irrigation Contractor shall assume full responsibility for any revision necessary.

1.11 REGULATORY REQUIREMENTS

A. Requirements of Regulatory Agencies: All work and materials shall be in full conformance with the latest rules and regulations of the California Plumbing and Electric codes.

B. Manufacturer's Directions: Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers of articles used in this contract furnish directions covering points not shown in the drawings and specifications.

C. Underwriters Laboratories: Electrical wiring, controls, motors, and devices shall be UL listed, and so labeled.

1.12 PRE-INSTALLATION MEETING

A. Convene one week prior to commencing work of this Section.

B. Schedule after major components have been initially staked.

1.13 COORDINATION

A. Coordinate the work with site backfilling, landscape grading and delivery of plant life.

1.14 SEQUENCE AND SCHEDULING

A. Install all piping and provisions for equipment assemblies such as risers, swing joints, and nipples when subgrade has been established but prior to spreading any on-site or imported material over subgrade.

B. Stage installation of work in area of stock piled material as necessary.

1.15 MAINTENANCE SERVICES

A. Installer's Field Services: Prepare and start systems under provisions of Section 01 71 16.

B. Maintain system during plant establishment and turf grow-in period specified in Section 32 90 00.

C. Instruct Owner personnel on detailed operation of system.

1.16 EXTRA MATERIALS

A. Furnish extra components:

1. Two valve keys for manual valves.
2. Two valve box keys.
3. Two keys for valve markers.
4. Two wrenches for each type head core and for removing and installing each type head.

1.17 WARRANTY

A. The warranty for the sprinkler irrigation system shall be made in accordance with the following form.

B. A copy of the warranty form shall be included in the operations and maintenance manual.

C. The warranty form shall be retyped onto the Contractor's letterhead and contain the following information

D. WARRANTY FOR SPRINKLER IRRIGATION SYSTEM

1. We hereby warrant that the sprinkler irrigation system we have furnished and installed is free from defects in materials and work quality, and the work has been completed in accordance with the drawings and specification. We agree to repair or replace any defects in material or work quality that may develop during the period of one year from the date of acceptance, except those that may be caused by ordinary wear and tear, unusual abuse or neglect. We also agree to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within a reasonable time after receipt of written notice from Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense, and we will pay the costs and charges therefore upon demand.
2. PROJECT:_____
3. CONTRACTOR:_____ PHONE NO.:_____
4. ADDRESS:_____ BY:_____
5. _____
6. DATE OF ACCEPTANCE:_____ BY:_____

PART 2 - PRODUCTS

2.01 PVC PIPE AND FITTINGS

A. PVC Materials: ASTM D1784, Type I Polyvinyl chloride plastic (PVC), cell classification 12454-B.

B. Class 200 PVC Pipe: ASTM D2241 listed with NSF-PW Standard 61 and Standard 14.

C. Class 315 PVC Pipe: ASTM D2241 listed with NSF-PW Standard 61 and Standard 14.

D. Schedule 40 PVC Pipe: ASTM D1785 listed with NSF-PW Standard 61 and Standard 14.

E. Flexible PVC Pipe: Agricultural Products Inc. 1174AG, Heavy Wall IPS Flex Vinyl (PVC) Pipe (C).

1. 1/2” IPS: 0.840” O.D., 0.147” wall thickness
2. 3/4” IPS: 1.05” O.D., 0.154” wall thickness
3. 1” IPS: 1.315” O.D., 0.179” wall thickness

F. PVC, Schedule 40 Socket Fittings: ASTM D2466 listed with NSF-PW Standard 61 and Standard 14.

G. PVC, Schedule 80 Socket Fittings: ASTM D2467 and listed with NSF-PW Standard 61 and Standard 14.

H. PVC, Schedule 80 Threaded Fittings: ASTM D2464 and listed with NSF-PW Standard 61 and Standard 14.

I. Gasket Joints: Comply with ASTM F477 and ASTM D3139

2.02 STEEL PIPE AND FITTINGS

A. Galvanized Pipe: Standard weight Schedule 40. Comply with ASTM A53.

B. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized, seamless steel pipe with threaded ends.

C. Malleable-Iron Unions: ASME B16.39, Class 150, hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface, and female threaded ends.

D. Gray-Iron Threaded Fittings: ASME B16.4, Class 125, galvanized, standard pattern.

E. Cast-Iron Flanges: ASME B16.1, Class 125.

F. Cast-Iron Flanged Fittings: ASME B16.1, Class 125, galvanized.

G. Galvanized Fittings: 150lbs. malleable iron, threaded. Comply with ASTM A53

H. Ductile Iron Pipe and Fittings: Comply with Section 33 11 00.

I. Cast Iron Pipe and Fittings: Comply with Section 33 11 00.

2.03 DRIPLINE PIPE AND FITTING

A. Dripline: 5/8" polyethylene tubing with integral self-cleaning pressure compensating emitters.

B. Dripline: As specified on the drawings. Fittings are to be by the same manufacturer and of type, style, and size to match dripline in accordance with manufacturer's recommendations.

2.04 PIPE SCHEDULE

A. Water Service: Conform to City standards.

B. Equipment Assemblies: Per referenced details.

C. Irrigation Mainline:
1. NPS ½” to 2”: Schedule 40 PVC, solvent weld joints and fittings.
2. NPS 2½” and 3": Class 200 PVC, solvent weld joints and fittings.
3. NPS 4" and larger: Class 200 PVC bell-end gasketed joints, ductile iron fittings.

D. Lateral Lines:
1. NPS ½” to 2”: Schedule 40 PVC, solvent weld joints and fittings.
2. NPS 2½” and 3": As specified on the Drawings, solvent weld fittings.

E. Sleeves: Schedule 40 PVC, solvent weld joints. Inside diameter shall be twice the outside diameter of pipe for which it is used.

F. PVC Fittings: Schedule 40 PVC unless otherwise indicated.

G. Swing Joint Assembly: Rainbird SA series, size and length as required.

2.05 EQUIPMENT

A. Remote Control Valves: As specified on the Drawings.

B. Ball Valves: Spears PVC Industrial Grade Compact Ball Valve

C. Gate Valves:
   1. As specified on the Drawings.
   2. 3" to 12": Comply with City Standards for water.

D. Quick Coupling Valves: As specified on the Drawings.

E. Master Valve: As specified on the Drawings.

F. Flow Sensor: As specified on the Drawings.

G. Controllers:
   1. As specified on Drawings.
   2. Powder coat enclosure color as selected by Landscape Architect. Submit available standard colors for selection.

2.06 ACCESSORIES

A. Control Wire: Copper, UL rated for direct burial, Type UF. Conform to NEC. Common shall be white and pilot wire shall be red. Spare control wires shall be of a different color approved by the Engineer.
   1. Pilot Wire: 14 Gauge
   2. Common Wire: 12 Gauge

B. Control Wire Connectors: Water tight. Rain Bird Pen-Tite Connectors, 3M DBY ore DBR direct burial splice kits, or fusible heat shrinking tubing, as specified on the Drawings or as approved. Sized as required for wire size and quantities at each splice.

C. Valve boxes: As indicated below. Provide one (1) 12" extension per box, unless different size otherwise indicated, by same manufacturer as box and stamp cover with identification of equipment or valve and controller number as applicable.
   1. Master Valve: Christy B36
   2. Flow Sensor: Christy B3 Utility Box
   3. Quick Coupler Valves: Christy B3 Utility Box.
   4. Gate Valves: Carson 1220 with T-cover and Bolt Down Loc-Kit, green.
   5. Remote Control Valves: Rainbird VB-JMB-H.
      a. Extension: Rainbird VB-JMB-EXT-B.
   6. Stub-Outs: Christy N30 box with bolt down lid.

D. Primer: Weldon P-70 PVC, IAMPO-UPC and NSF listed.

E. Solvent Weld Cement:
   1. Comply with ASTM D2564, IAMPO-UPC and NSF listed. Compatible with pipe being joined and job site conditions.

F. Galvanized Pipe Paint: Carbon elastic Paint No. 2221 by American Tar Company or equal.

G. Thrust Blocks: As specified in the Drawings.

H. Pull line/cord: Polypropylene braided line or Let-line #232 or equal of 1/8" diameter with a minimum break strength of 200 pounds.

I. Remote Control Valve ID Tag: All vinyl, with embossed lettering and tie for valve connection. Christie, Ewing or equal.

2.07 IRRIGATION HEADS

A. Drip Assemblies: As specified on the Drawings

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify location of existing utilities.

B. Verify that required utilities are available, in proper location, and ready for use.

C. Verify that field conditions are acceptable and are ready to receive work.

D. Verify location of underground utilities and facilities. Drawings may show utilities in some locations but do not necessarily represent all underground utilities and facilities. Obtain locations prior to start of Work.

E. Verify that required utilities are available, in proper location, and ready for use.

F. Verify locations of existing sleeves. Notify Landscape Architect of discrepancies in existing sleeve locations and system requirements.

G. Beginning of installation shall signify acceptance of existing conditions.

H. Verification of Existing Pressure:

1. Verify existing static pressure prior to ordering irrigation components. Submit test results to Landscape Architect for further direction.

3.02 PREPARATION

A. Call Underground Service Alert 48 hrs prior to start of work. Field mark underground utilities prior to excavation. Make provisions to protect underground utilities and facilities.

B. Piping layout indicated is diagrammatic only. Route piping to avoid plants, ground cover, utilities, and structures and as directed. Locate in landscape areas wherever possible

C. Layout and stake locations of system components.

1. Layout by Survey: At a minimum, the following shall be laid out by survey using a qualified surveyor.

a. Mainline

D. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system.

E. Layout shall be reviewed by the Landscape Architect or Owner at pre-installation meeting prior to installation.

3.03 GENERAL

A. Install all equipment in compliance with applicable codes and regulations and manufacturer's printed instructions and specifications.

B. Provide all incidental materials, equipment, and components required for a complete and functional system even if such material, equipment, and components are not specifically included in the Drawings or Specifications.

3.04 TRENCHING

A. Trench bottom shall be flat to ensure piping is supported continuously on an even grade.

B. Where lines occur under paved areas, consider dimension to be below the subgrade.

C. Trench Size:
   1. Width: As indicated on the Drawings.
   2. Depth as required to provide for bedding and minimum cover as specified. Coordinate depths of various pipe runs as required to minimize conflict. Maintain consistent depths of each of line except as pre-approved by Landscape Architect.

D. Schedule of Minimum Pipe Cover:
   1. Water Service Line: Per City or other local Standards
   2. Mainline:
      a. Pipe Sizes Less Than 4 inches: 24 inches.
      b. Pipe 4 inches and Larger: 30 inches
   3. Lateral Lines: 18 inches.
   4. Control Wire: 24 inches.
   5. All Pipe and Control Wire Under Paving: 36 inches minimum. Provide additional depth as required to provide a minimum of 12 inches cover to bottom of subgrade in new paving areas.

E. Trenching adjacent to existing trees shall be excavated by hand or machine boring as directed by the Landscape Architect. Comply with the City Standards.

F. Trench to accommodate grade changes.

G. Maintain trenches free of debris, material, or obstructions that may damage pipe.

3.05 PIPE INSTALLATION

A. General
   1. Comply with manufacturer's printed instructions and recognized industry standards.
   2. Pipe and equipment installed in trenches shall be fully supported by approved trench foundation material.

3. Pipe and equipment installed above grade shall be properly and securely anchored and supported by approved devices and means.
4. Pipe under paved areas shall be installed in PVC pipe sleeves.
5. Line Clearance: All lines shall have a minimum clearance of 6 inches from each other and from lines of other trades. Comply with applicable regulations for clearance between irrigation lines and other trades.
6. Parallel lines shall not be installed directly over one another.
7. Install pipe to allow for expansion and contraction without stressing pipe or joints.
8. Install trace wire as indicated in drawings.
9. Install 3" warning tape 12" above mainline.

B. PVC, Solvent-Cement Welded Joints
1. Comply with manufacturers' written specifications.
2. Comply with ASTM D2855 and ASTM F402

C. PVC, Threaded Joints:
1. Use teflon tape for plastic to plastic and plastic to galvanized joints. Hand tighten and use only light wrench pressure as required to produce sound, water tight joint.
2. Use pipe joint compound for galvanized to galvanized joints.

D. PVC, Gasket Joints:
1. Comply with manufacturers' written instructions.
2. Comply with ASTM D3139.

E. Galvanized Pipe:
1. Comply with industry standards.
2. Paint all below grade galvanized pipe with specified galvanized pipe paint.

F. Thrust Blocks:
1. Thrust blocks shall be cast-in-place concrete of the size and configuration appropriate for installation condition.
2. Comply with Standard Specifications and as indicated on the Drawings.
3. Leave thrust blocks exposed until pressure testing is complete.

3.06 EQUIPMENT INSTALLATION

A. Remote Control Valves:
1. Locate all valves a directed.
2. Install per applicable details.
3. Install after mainline has passed pressure test.
4. Flush mainline of all debris before installing valves.
5. Install each valve in a separate valve box.
6. After installation, re-pressurize mainline, check for leak, and eliminate all leaks.

7. Securely attach one ID tag per valve with number or lettering corresponding to vavles station on controller schedule.

B. Manual Drain Valves: Install at all low points in system.

C. Controller:
   1. Locate as directed.
   2. Install and wire in conformance with manufacturer's published instructions and specifications
   3. Construct concrete footings as indicated and as required to support the controller cabinet.
   4. Wire only one valve per station.
   5. Make connection to electrical supply. Conform to applicable regulations and codes. Provide dedicated breaker of proper size for each controller. Provide one (1) additional duplex outlet at each controller. All electrical work shall be performed by properly licensed electrician.

D. Remote Control Valve Control Wiring:
   1. Above grade wire shall be installed in approved conduit. Extend conduit to the full required depth of cover. Transition from vertical to horizontal alignment shall be made with a sweep elbow.
   2. Lay control wire in mainline trench immediately adjacent to mainline wherever possible. Bundle wires with electrical tape at 10 feet intervals. Do not tape to mainline.
   3. Run a separate pilot wire to each control valve.
   4. Run a common ground for all control valves on a common controller. Provide a separate ground wire for each controller.
   5. Make splices in valve boxes only. Use specified connectors. Provide a 36 inch loop at each valve.
   6. Extra Control Wire: Install for future valves, if any, where indicated on the Drawings. Extra control wire shall not be used as spares without approval from Landscape Architect.
   7. Spare Control Wires:
      a. Install one spare common wire the full length of the mainline.
      b. Install spare control wires at a ratio of 1 per each 6 valves the full length of the mainline. Provide a 36 inch loop at each valve.
   8. Label ends of control wire indicating controller, valve number, and station. Use waterproof marker.

E. Valve Boxes
   1. Excavate to required subgrade.
   2. Place drain rock to specified depth and width prior to setting support blocks and valve box. At a minimum, drain rock shall be 12 inches deep and shall be the full width and length of the box extending 3 inches past the edges of the valve box.
   3. Set valve boxes plumb and square with adjacent structures and adjacent boxes.
      a. Paved condition: Set box so that top of box is flush with adjacent paving.
      b. Turf: Set box so that top of box is 1/2" above adjacent finish grade.

c. Landscape Condition: Set boxes so that top of box is 1" above adjacent finish grade.

4. Mark top of each box with approved designation of type of equipment housed within it. Use approved permanent means of marking. Identify zone number of remote control valves.

F. Quick Coupler

1. Locate 12" from paved surface unless approved otherwise.

3.07 FIELD QUALITY CONTROL

A. Identify the following scheduled observations in the Progress Schedule and provide notifications to Landscape Architect and Owner prior to each as follows:

1. Backflow assembly location: 48 hours.
2. Pressure supply line installation and testing: 48 hours.
3. Automatic controller location: 48 hours.
4. Control wire installation: 48 hours.
5. Lateral line and sprinkler installation: 48 hours.
6. Coverage test: 48 hours.
7. Final site review: 7 days.

B. When observations have been conducted by other than the Landscape Architect or Designated Representative, show evidence in writing of when and by whom these observations were made.

C. No site observations will commence without Record Drawing redline prints.

D. Pressure Testing:

1. General:

a. All hydrostatic pressure tests in the presence of the Landscape Architect or Owner representative. No pipe shall be completely backfilled until it has been inspected, tested and approved in writing.

b. Center load all pipe runs and secure as required to prevent damage to system during testing. Do not cover any joints or fittings.

c. Fill pipe with water a minimum of 24 hours prior to testing.

d. Furnish all force pumps and equipment required to conduct tests. Do not use system's booster pump to pressurize lines.

e. Conduct all pressure tests prior to spreading any soil amendment material.

f. Correct all deficiencies revealed by testing.

2. Mainline: Prior to installation of electrical control valves, quick couplers or any other equipment that might prevent a proper test from being performed pressurize mainline to 150 pounds per square inch and maintain pressure for a period of 6 hours.

3. Lateral Lines: Prior to installation of heads, cap risers and swing joints and pressurize to 100 pounds per square inch and maintain pressure for a period of 2 hours.

4. All Piping Under Paved Areas: pressurize to 150 pounds per square inch for a period of 2 hours and proved watertight prior to paving.

E. Coverage Test: When the sprinkler irrigation system is completed, perform a coverage test in the presence of the Landscape Architect or Designated Representative to determine if the water coverage for planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from plans.

1. Perform in presence of Landscape Architect and Owner representative.
2. Run each zone for sufficient length of time to demonstrate coverage and uniform application.
3. Adjust system components as required to correct inadequate or non-uniform coverage.

F. All tests that fail will require additional testing at Contractor's expense, including Landscape Architect's time and expenses, until accepted by Landscape Architect.

G. Final Observation:

1. The Contractor shall operate each system in its entirety for the Landscape Architect or Designated Representative at time of final observation. Any items deemed not acceptable by the Landscape Architect or Owner, or not in compliance with these specifications and drawings, shall be reworked to the complete satisfaction of the Landscape Architect and Owner.
2. The Contractor shall show evidence to the Landscape Architect that the Owner has received all accessories, charts, record drawings, and equipment as required before final observation can occur.

3.08 BACKFILLING

A. Clean trenches of debris and deleterious material.

B. Backfill trench and compact to specified subgrade elevation. Protect piping from displacement.

C. Backfill only after specified tests have been performed and Engineer's acceptance has been obtained.

D. Clean trenches of debris and rocks.

E. Bed pipe as indicated on the Drawings.

F. Place initial fill of select material as indicated on Drawings.

G. Backfill with approved native soil free of rocks, sticks, debris and other deleterious material.

H. Compaction

1. In landscape areas match compaction of landscape area soil and as required to prevent settling.
2. Under areas to be paved compact to a minimum of 95% per ASTM D1557. Meet minimum compaction requirements for pavement section

3.09 TEMPORARY REPAIRS

A. The Owner reserves the right to make temporary repairs as necessary to keep the sprinkler system equipment in operating condition. The exercise of this right by the Owner shall not

relieve the Contractor of his responsibilities under the terms of the warranty as herein specified.

3.10 SYSTEMS STARTUP

A. Adjust control system to achieve time cycles required.

B. Adjust control system to achieve time cycles required to deliver proper precipitation rates for the various planting types. Adjust sequencing of stations such that the required watering can be accomplished during the Owner-specified watering time window.

C. Radii shall not be reduced by more than 25% of the nozzle's radius as determined by manufacturer.

3.11 MAINTENANCE

A. The entire sprinkler irrigation system shall be under full automatic operation for a period of seven days prior to any planting.

B. The Landscape Architect or Owner Representative reserves the right to waive or shorten the operation period.

C. Maintain system during the plant establishment period specified in Section 32 90 00.

3.12 CLEANUP

A. Cleanup shall be performed as each portion of the work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be broomed or washed down, and any damage sustained to the work of others shall be repaired and work returned to its original condition.

3.13 OPERATING INSTRUCTIONS

A. The Contractor shall train Owner’s maintenance personnel in proper operation of all major equipment. Provide written evidence of the person or persons so trained.

3.14 DEMONSTRATION

A. Instruct Owner's personnel in operation and maintenance of system. Use operation and maintenance material as basis for demonstration.

END OF SECTION

SECTION 32 90 00

PLANTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Trees.

B. Shrubs.

C. Ground covers.

D. Plants.

E. Topsoil and soil amendments.

F. Fertilizers and mulches.

G. Stakes and guys.

H. Landscape edgings.

1.03 MEASUREMENT AND PAYMENT

A. Payment of the various Construction Items described in the Schedule of Values shall be considered full compensation for work of this Section.

B. Unit prices for soil preparation and for items that include backfill mixes shall be adjusted to reflect changes due to the requirements of soil lab recommendation.

1.04 RELATED SECTIONS

A. Section 32 80 00 – Irrigation: Coordination with head, pipe, and equipment locations.

B. Section 31 22 19 – Finish Grading: Topsoil

C. Section 32 01 90 – Landscape Maintenance

1.05 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Materials List:

1. Within 15 days of Award, submit documentation that specified plants have been ordered. Include names and addresses of suppliers.

2. Submit requests for substitutions with materials list.

C. Delivery Tickets:
   1. Submit for all plants installed as part of the Project.
   2. Include full botanical and common names of all plants.

D. Product Data - Submit data on the following:
   1. Soil amendments.
   2. Herbicides.
   3. Fertilizers.
   4. Substitutions for specified accessories.
   5. Root Barrier.

E. Product certificates signed by manufacturers certifying that their products comply with specified requirements.
   1. Manufacturer's certified analysis for standard products.
   2. Analysis for other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
   3. Label data substantiating that plants, trees, shrubs, and planting materials comply with specified requirements.

F. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
   1. Certification of each seed mixture for sod, identifying sod source, including name and telephone number of supplier.

G. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated.
   1. Analysis of existing surface soil.
   2. Analysis of imported topsoil.

H. Samples of each of the following:
   1. 5 lb of mineral mulch for each color and texture of stone required for Project, in labeled plastic bags.
   2. Submit a 1 cubic foot sample of the following. Indicate supplier.
   3. Organic matter.
   4. Mulch.
   5. Edging materials and accessories to verify color selection.

I. Planting schedule indicating anticipated dates and locations for each type of planting.

J. Test Reports: Submit soil test results and recommendations.

K. Maintenance instructions recommending procedures to be established by Owner for maintenance of landscaping during an entire year. Submit before expiration of required maintenance periods.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that landscaping is in progress.

B. Provide quality, size, genus, species, and variety of trees and shrubs indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock."

C. Plant nomenclature shall conform to that used in New Sunset Western Garden Book, 2000 edition or later, published by Sunset Publishing Corporation. Names and varieties not listed in this reference shall be those most commonly used in the nursery trade.

D. Topsoil Analysis: Furnish a soil analysis made by a qualified independent soil-testing agency stating percentages of organic matter, inorganic matter (silt, clay, and sand), deleterious material, pH, and mineral and plant-nutrient content of topsoil.

1. Report suitability of topsoil for growth of applicable planting material. State recommended quantities of nitrogen, phosphorus, and potash nutrients and any limestone, aluminum sulfate, or other soil amendments to be added to produce satisfactory topsoil.

E. Measurements: Measure trees and shrubs according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above ground for trees up to 4-inch caliper size, and 12 inches above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

F. Herbicides shall be applied by licensed applicator. Submit name, address, and license number of application firm.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

B. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

C. Trees and Shrubs: Deliver trees and shrubs in sizes as indicated in the drawings. Do not prune before delivery, except as approved by Landscape Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery. Do not drop trees and shrubs during delivery.

D. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately. If planting is delayed more than 6 hours after delivery, set

planting materials in shade, protect from weather and mechanical damage, and keep roots moist.

1. Do not remove container-grown stock from containers before time of planting.
2. Water root systems of trees and shrubs stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.08 PROJECT CONDITIONS

A. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect before planting.

C. Planting operations shall not be conducted under the following conditions:
   1. Freezing weather.
   2. Excessive heat.
   3. High winds.
   4. Excessively wet conditions.

1.09 SEQUENCING AND SCHEDULING

A. Coordinate planting operations with other construction to avoid damage to plants by other trades.

1.10 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Warrant the following living planting materials for the following specified time period after date of Substantial Completion, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, abnormal weather conditions unusual for warranty period, or incidents that are beyond Contractor's control.
   1. Trees – 1 year.
   2. Shrubs – 1 year.
   3. Ground covers – Length of maintenance period.

C. Remove and replace dead planting materials immediately unless required to plant in the succeeding planting season.

D. Replace planting materials that are in a substantially unhealthy condition (more than 25 percent of the plant dead or removed due to death of branches, etc.) at end of warranty period.

E. A limit of one replacement of each plant material will be required, except for losses or replacements due to failure to comply with requirements.

PART 2 - PRODUCTS

2.01 TREE AND SHRUB MATERIAL

A. General: Furnish nursery-grown trees and shrubs conforming to ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully-branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

B. Grade: Provide trees and shrubs of sizes and grades conforming to ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Landscape Architect.

C. Label at least 1 tree and 1 shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.

2.02 CONIFEROUS EVERGREENS

A. Form and Size: Normal-quality, well-balanced, coniferous evergreens, of type, height, spread, and shape required, conforming to ANSI Z60.1.

2.03 GROUND COVERS AND PLANTS

A. Provide ground covers and plants established and well rooted in removable containers or integral peat pots and with not less than the minimum number and length of runners required by ANSI Z60.1 for the pot size indicated.

2.04 GRASS MATERIALS

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances. Seed shall be of the latest crop, labeled in accordance with the California Food and Agricultural Code.

1. Seed mix as indicated on the plans.

2.05 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, 4 percent organic material minimum, free of stones 1 inch or larger in any dimension, and other extraneous materials harmful to plant growth. Any topsoil added shall be thoroughly mixed with the existing site soil to a depth of 12” minimum (unless otherwise noted on drawings).

1. Topsoil Source: Amend existing surface soil to produce topsoil. Supplement with imported topsoil when required.

2.06 SOIL AMENDMENTS

A. Lime: ASTM C 602, Class T, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent, with a minimum 99 percent passing a No. 8 sieve and a minimum 75 percent passing a No. 60 sieve.

1. Provide lime in the form of dolomitic limestone.

B. Aluminum Sulfate: Commercial grade, unadulterated.

C. Sand: Clean, washed, natural or manufactured sand, free of toxic materials.

D. Perlite: Horticultural perlite, soil amendment grade.

E. Peat Humus: Finely divided or granular texture, with a pH range of 6 to 7.5, composed of partially decomposed moss peat (other than sphagnum), peat humus, or reed-sedge peat.

F. Sawdust or Ground-Bark Humus: Decomposed, nitrogen-treated, of uniform texture, free of chips, stones, sticks, soil, or toxic materials.

G. Manure: Well-rotted, un-leached stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

H. Water: Potable.

2.07 HERBICIDES

A. EPA registered and approved, of type recommended by manufacturer.

B. Surflan, Round-Up or approved equal.

2.08 FERTILIZER

A. Bonemeal: Commercial, raw, finely ground; minimum of 4 percent nitrogen and 20 percent phosphoric acid.

B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea-form, phosphorous, and potassium in the compositions as indicated on the drawings or as recommended by the soil test (soil test recommendation to take precedence over drawings).

2.09 MULCHES

A. Organic Mulch: Organic mulch, free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Wood and bark chips – refer to drawings.

B. Mineral Mulch: Hard, durable stone, washed free from loam, sand, clay, and other foreign substances, of following type, size range, and color:

1. Rounded riverbed gravel or smooth faced stone.
2. Crushed stone or gravel. – per plans.

2.10 STAKES AND GUYS

A. Upright: Rough-sawn, sound, new hardwood, redwood, or pressure-preservative-treated softwood, free of knots, holes, cross grain, and other defects, 2 by 2 inches by length indicated, pointed at one end.

B. Guy and Tie Wire: ASTM A 641, Class 1, galvanized-steel wire, 2-strand, twisted, 0.106 inch in diameter.

C. Guy Cable: 5-strand, 3/16-inch diameter, galvanized-steel cable, with zinc-coated turn buckles, 3-inch- long minimum, with two 3/8-inch- galvanized eyebolts.

D. Hose Chafing Guard: Reinforced rubber or plastic hose at least 1/2 inch in diameter, black, cut to lengths required to protect tree trunks from damage.

E. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.

2.11 LANDSCAPE EDGINGS

A. Edging: Refer to drawings.

2.12 ROOT BARRIER

A. Deep Root UB-24-2.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Start of work shall indicate Contractor's acceptance of existing conditions.

3.02 PREPARATION

A. Conduct weed control measures as specified in the drawings.

B. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, and secure Landscape Architect's acceptance before the start of planting work. Make minor adjustments as may be required.

3.03 PLANTING SOIL PREPARATION

A. Soil Testing: confirm that required soil testing has been completed and that soil mixes and soil preparation specifications have been revised to reflect the recommendations of the soils laboratory as approved by Landscape Architect.

B. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

C. Mix soil amendments and fertilizers with topsoil at rates indicated. Delay mixing fertilizer if planting does not follow placing of planting soil within a few days.

D. For tree pit or trench backfill, mix planting soil before backfilling and stockpile at site.

E. For planting beds and lawns, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.

3.04 GROUND COVER AND PLANT BED PREPARATION

A. Till soil in beds to a minimum depth of 12 inches and mix with specified soil amendments and fertilizers.

3.05 EXCAVATION FOR TREES AND SHRUBS

A. Pits and Trenches: Excavate with vertical sides and with bottom of excavation slightly raised at center to assist drainage. Loosen hard subsoil in bottom of excavation.

1. Container-Grown Trees and Shrubs: Excavate pits twice the width and 1½ the depth of the container.

B. Mix subsoil removed from landscape excavations with soil amendment to use as backfill.

C. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

D. Drainage: Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.

E. Fill excavations with water and allow to percolate out before placing setting layer and positioning trees and shrubs.

3.06 PRE-EMERGENT HERBICIDE

A. Apply herbicides in accordance with manufacturer's recommended rates and procedures.

B. Apply to soil of all planting bed areas prior to placement of mulch.

3.07 PLANTING TREES AND SHRUBS

A. Set container-grown stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.

1. Carefully remove containers so as not to damage root balls.
2. Place stock on setting layer of compacted planting soil.
3. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.

B. Dish and tamp top of backfill to form a 3-inch-high mound around the rim of the pit (not in turf). Do not cover top of root ball with backfill.

3.08 TREE AND SHRUB PRUNING

A. Prune, thin, and shape trees and shrubs as directed by Landscape Architect.

3.09 TREE AND SHRUB GUYING AND STAKING

A. Upright Staking and Tying: Use a minimum of 2 stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend at least 72 inches above grade. Set vertical stakes and space to avoid penetrating balls or root masses. Support trees with 2 strands of tie wire encased in hose sections at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree. Refer to staking detail in the drawings.

B. Guying and Staking: Guy and stake trees exceeding 14 feet and more than 3-inch caliper unless otherwise indicated. Securely attach no fewer than 3 guys to stakes 30 inches long, driven to grade. Attach flags to each guy wire, 30 inches above finish grade.

3.10 PLANTING GROUND COVER AND PLANTS

A. Space ground cover and plants as indicated on the drawings.

B. Dig holes large enough to allow spreading of roots, and backfill with planting soil. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

3.11 MULCHING

A. Mulch backfilled surfaces of pits, trenches, planted areas, and other areas indicated.

B. Mulch: Apply the following average thickness of mulch per plans and finish level with adjacent finish grades. Do not place mulch against trunks or stems.

1. Thickness: As indicated on drawings.

3.12 INSTALLATION OF EDGINGS

A. Wood Headers: Install wood headers or edgings where indicated. Anchor with wood stakes spaced up to 36 inches apart, driven at least 1 inch below top elevation of header or edging. Use 2 galvanized nails per stake to fasten headers and edging; length as needed to penetrate both members and provide 1/2-inch clinch at point. Pre-drill stakes when needed to avoid splitting.

3.13 CLEANUP AND PROTECTION

A. During landscaping, keep pavements clean and work area in an orderly condition.

B. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.14 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION

SECTION 32 92 13
HYDROSEEDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Furnish all labor, materials and equipment necessary to complete the landscape work as shown on the drawings and as specified.

1.2 RELATED SECTIONS

A. Section 32 90 00 – Planting: Preparation, edging, coordination with other landscaping activities.

1.3 MEASUREMENT AND PAYMENT

A. Payment of the various Construction Items described in the Schedule of Values shall be considered full compensation for work of this Section.

PART 2 PRODUCTS

2.1 MATERIALS

A. Hydro-Seeding Fiber Mulch

1. Provide Hydro-Mulch as manufactured by Conwed, or other approved, composed of wood cellulose fiber and containing no germination or growth-inhibiting factors. Ensure a consistent texture which disperses evenly and remains suspended in agitated water. Provide with a temporary green dye and the following percentage property analyses: moisture content - 9 plus or minus 3 a.d. basis; organic matter - 99.2 plus or minus 0.8; ash content - 0.9 plus or minus 0.2; H - 4.8 plus or minus 0.5; water holding capacity (grams of kb0 per 100 grams of fiber) - 1150 minimum.

B. Hydro-Seeding Additive (Binder)

1. Provide Ecology Control-M-Binder organic seeding additive.

C. Hydro-Seeding Fertilizers

1. The commercial fertilizers shall conform to the requirements of the California Food and Agricultural Code; shall be uniform in composition, with the following guaranteed chemical analysis:

	Percentage	
Ingredient	Min:	Max:
Nitrogen	12	15
Phosphoric Acid	12	15
Water Soluble Potash	12	15

D. Seed Mix

1. Incorporate the seed uniformly in hydromulch at the rates per acre specified in the drawings or by the seed supplier for the selected seed. Seed shall be of the latest crop, labeled in accordance with the California Food and Agricultural Code.
2. Approved suppliers:
    a. Delta Bluegrass Company, (800) 637-8873
    b. Pacific Coast Seed, Inc. (800) 733-3462
    c. Approved equal.

E. Slurry Mix Components per Acre
1. 3,500 gallons water
2. 1,500 lbs. wood cellulose mulch
3. seed at 10 lbs per 1000 sq ft
4. 500 lbs. fertilizer

PART 3 EXECUTION

3.1 GENERAL

A. Conform to Section 32 90 00.

B. Provide mixes specified on drawings and/or specified herein.

C. Apply hydro-seed by approved hydro-mulch company.

D. Slurry mixture, which has not been applied within four (4) hours of mixing, shall not be used and shall be removed from the site.

E. After application, the Contractor shall not operate any equipment over the covered area.

3.2 EXAMINATION

A. Examine areas to receive hydro-seeding for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Start of work shall indicate Contractor's acceptance of existing conditions.

3.3 PREPARATION

A. Conform to Section 32 90 00.

3.4 APPLICATION

A. Apply in a form of slurry consisting of cellulose fiber, seed and chemical additives, commercial fertilizer and water. When hydraulically sprayed on soil, ensure that hydro-mulch forms a blotter-like groundcover impregnated uniformly with seed and fertilizer and allows the absorption of moisture and rainfall to percolate to the underlying soil.

B. Hydraulic Equipment used for the application of slurry shall be a commercial type Hydro-Seeder and have a built in agitation system with an operating capacity sufficient to agitate, suspend and homogeneously mix slurry. Distribution lines shall be, large enough to provide

even distribution of the slurry over the ground. The pump must be capable of exerting up to 150 psi at the nozzle. The slurry tank shall have a minimum capacity of 1,000 gallons and shall be mounted on a traveling unit, which will place the slurry tank and spray nozzles within sufficient proximity to the areas to be seeded so as to provide uniform distribution without waste.

C. Prepare the slurry at the project site by first adding water to the tank when the engine is at half throttle. When water level has reached height of agitator shaft provide full re-circulation then add seed, followed by fertilizer, then mulch. Only add the mulch to the mixture after the seed and the tank is at least 1/3 filled with water. By the time the tank is 2/3 to ¾ full, all mulch should be in. Commence spraying immediately when the tank is full.

D. Spray with a uniform visible coat by using the green color of the mulch as a guide. Apply the slurry in a sweeping motion, in an arched stream so as to fall like rain allowing the wood fibers to build on each other until a good coat is achieved and the material is spread at required rates.

E. Fill out daily worksheets by the nozzle-man, with the following information: Seed type and amount, fertilizer analysis and amount, mulch type and amount seeding additive type and amount, number of loads and amount of water, area covered, and equipment used, capacity and license number.

F. Do not allow any slurry to be sprayed into any reservoir, basin or drainage ditches and channels, which may impede free flow or rain or irrigation water. Clean up spilled slurry on sidewalks, concrete structures and streets.

G. After application of hydro-mulch, wash excess material from previously planted materials and architectural features. Avoid washing or eroding mulch materials.

H. Ensure that application equipment has built-in agitation system and operating capacity sufficient to agitate, suspend and mix a slurry containing not less than 40 pounds of fiber mulch plus a combined total of 7 pounds fertilizer solids for each 100 gallons of water.

3.5 REVIEW

A. Owner's representative or County staff must be present at the time of hydroseeding unless they direct otherwise.

3.6 WEED CONTROL

A. The contractor shall apply the broad leaf herbicide after forty-five (45) days but not before the third mowing. The herbicide shall be applied in accordance, with the manufacturer's printed directions.

3.7 MAINTAINING LANDSCAPE AREA

A. The Contractor shall maintain the entire landscaped area of his contract for a minimum of sixty (60) days commencing after final acceptance. If upon inspection, after sixty (60) days, the landscaping is found to be in healthy, growing condition, the Owner will take over maintenance. If however, the landscaping is not developed properly, the Contractor shall continue maintaining until the situation is corrected and approved.

3.8 ACCEPTANCE

A. Completed work will be observed by Owner's Representative and/or County Staff. Any corrections generated by this observation will be submitted to the subcontractor in writing and corrected at Contractor's expense. Corrected items are to be signed off by Landscape Architect.

B. Upon final acceptance, Contractor to walk through with property management instructing as to the operation of maintenance of all landscaping.

3.9 GUARANTEE

A. Hydroseeding Contractor shall guarantee complete coverage of the area to be hydroseeded and at least 90% germination of the seed. Contractor shall guarantee germination within thirty (30) days from time of seeding.

END OF SECTION

SECTION 33 11 16

SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe and fittings for domestic water line, including a 3-inch, 1-1/2-inch domestic water and irrigation service and 8-inch fire water service.

B. Valves and fire department connection (see also mechanical specifications).

C. Fire Hydrant

D. Pressure Testing.

1.2 RELATED SECTIONS

A. Section 21 10 00 Fire Sprinkler Systems

B. Section 31 22 00 Grading

C. Section 32 23 16.13 - Trenching

D. Section 33 13 00 Disinfecting of Water Utility Distribution

1.3 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 01.

1.4 SCHEDULING

A. Schedule work under the provisions of Division 01.

1.5 REFERENCES

A. Geotechnical Investigation - See Information Available to Bidders.

B. ASTM D2241 - Standard Specification for Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series); 2005.

C. ASTM D 3139-19 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.

D. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association; 2000 (ANSI/AWWA C111/A21.11).

E. AWWA C504 - Rubber Seated Butterfly Valves; American Water Works Association; 2006.

F. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; American Water Works Association; 2001 (ANSI/AWWA C509).

G. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in. (100 mm Through 300 mm), for Water Distribution; American Water Works Association; 1997 (ANSI/AWWA C900/C900a).

H. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. (13 mm) through 3 in. (76 mm), for Water Service; American Water Works Association; 2002.

I. Mono county General Plan; Development Standards; Chapter 22 – Fire Safe Regulation

1.6 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves, water meter, backflow preventer, fire department connection, and accessories.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.7 QUALITY ASSURANCE

A. Perform work in accordance with Mono County Standards and Caltrans Standard Specifications.

1.8 DELIVERY STORAGE AND HANDLING

A. Deliver and store valves and fittings in shipping containers with labeling in place.

PART 2 PRODUCTS

2.1 WATER PIPE

A. Fire Water Service: 8-inch PVC Pipe, AWWA C900 with restraints, DR-18 Class 235:

1. Fittings: AWWA C104, AWWA C110, AWWA C111, or AWWA C153, cast or ductile iron for a working pressure of 250 or 350 psi; fittings shall be encased with 8-mil polyethylene in accordance with ANSI A21.5 (AWWA C105).

2. Joints: Push-on or mechanical type and shall conform to ANSI 21.11 (AWWA C111) or ASTM D3139 with elastomeric gaskets.

B. Domestic Water Service: 3-inch HDPE IPS pressure pipe according to ASTM F714.

1. Pipe Compound: PPI TR-4 PE 4710, ASTM D3350 Cell Class, 445574 CC 2 or 3

2. Certification: ANSI/NSF 61, ANSI/NSF 14*

C. Irrigation Water Service: 1-1/2-inch SDR 9 250 PSI CTS Blue Ultra Potable Water Poly Pipe or approved equivalent.

D. Marking Tape and Location Wire:

1. Underground marking tape and location wire shall be installed according to the manufacturer's instructions and as shown on the Drawings. Marking tape shall be detectable aluminum foil marking tape with a nylon encasement. Tape shall be 3 inches wide and bear the following in large printing: "BURIED WATER LINE BELOW". Location wire shall be solid 12-gauge insulated copper wire. Marking tape and location wire shall extend into all valve boxes with 2 feet minimum free and accessible from the valve box cover. Marking tape and location wire shall be continuous between valves and appurtenances. Free ends resulting from breaks in the tape or at the beginning of a new roll shall be joined together to form a continuous connection. Location wire shall be

adequately spliced together at free ends to ensure a positive watertight electrical connection.

2.2 VALVES

A. General: Manufacturer's name and pressure rating marked on valve body.

B. Gate Valves up to 8 inches

1. Ductile iron, flanged, resilient wedge, pre-grooved stem, bolted bonnet, and lead free.
2. Substitutions: In accordance with Division 01.

C. Gate Valves up to 3 inches

1. Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, compression ends, with control rod, post indicator, valve key, and extension box.
2. Substitutions: In accordance with Division 01.

D. Ball Valves up to 3 inches

1. Brass body, Teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA inlet end, compression outlet with electrical ground connector, with control rod, valve key, and extension box.
2. Substitutions: In accordance with Division 01.

2.3 APPURTENANCES

A. Fire Department Connection

1. Brass body, freestanding with double clappers, female hose thread swivel inlet, cover sleeve, seamless brass tubing, brass branded plate, and brass plugs and chains.
2. Include 5" Storz fitting and two 2.5" diameter connections.
3. Manufacturer: Croker, Guardian Fire Equipment, or equivalent.
4. Substitutions: In accordance with Division 01.

B. Backflow Preventer

1. Reduced pressure backflow preventer for 3-inch domestic water service– see Section 21 10 00.
2. Reduced pressure backflow preventer for 6-inch fire water service– see Section 21 10 00.
3. For backflow preventer for irrigation service refer to plumbing and mechanical specifications.

C. Fire Hydrant

1. See Section 21 10 00.
2. The hydrant head shall be brass with 2-1/2 inch National Hose male thread with cap for pressure and gravity flow systems and 4-1/2-inch draft systems. Such hydrants shall be dry barrel to be confirmed by the delivery system. They shall have suitable crash protection as required by the local jurisdiction.

2.4 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 32 23 16.13, Trenching.

B. Cover: As specified in Section 32 23 16.13, Trenching.

2.5 ACCESSORIES

A. Water Meter: see mechanical specifications.

PART 3 EXECUTION

3.1 PREPARTION

A. Verify that service connection and water main size, location, and invert are as indicated on Contract Drawings.

B. Cut pipe ends square, ream pipe and tube ends to full pipe diameter; remove burs.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare pipe connections to equipment with flanges or unions.

3.2 TRENCHING

A. See related sections for additional requirements.
   1. Section 21 22 00, Grading
   2. Section 32 23 16.13, Trenching

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Backfill around sides and top of pipe with bedding material, tamp in place and compact, then complete backfilling.

3.3 PIPE INSTALLATION

A. Maintain separation of water main from other utilities as required by codes.

B. Group piping with other site piping work whenever practical.

C. Establish elevations of buried piping to ensure required minimum depth of cover.

D. Install pipe to indicated elevations to within tolerance of 5/8 inches.

E. Route pipe in straight line.

F. Install pipe to allow for expansion and contraction without stressing pipe or joints.

G. Install access fittings to permit disinfection of water system performed under Section 33 13 00, Disinfection of Water Distribution System.

H. Slope water pipe and position drains to low points.

I. Install location wire 0 inches above top of pipe; coordinate with Section 32 23 16.13, Trenching.

3.4 VALVE AND APPURTENANCES INSTALLATION

A. Set valves on solid bearing surface.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Install fire department connection according to manufacturer's instructions and as indicated on the plans in coordination with the Fire Department.

3.5 FIELD QUALITY CONTROL

A. Pressure test water piping to 150 psi with a water test.

B. Alternatively, air test pipe system to 50 psi.

C. If tests indicate work does not meet specified requirements, remove work, replace, and retest at no cost to the Owner.

END OF SECTION

SECTION 33 13 00

DISINFECTING OF WATER UTILITY DISTRIBUTION

PART 1 GENERAL

A. SECTION INCLUDES

1. Disinfection of site domestic water line and fire water line.

B. RELATED SECTIONS

1. Section 33 11 16 Site Water Utility Distribution Piping

C. PROJECT RECORD DOCUMENTS

1. Submit under provisions of Division 01.

D. REGULATORY REQUIREMENTS

1. Conform to applicable codes or regulations for performing the work of this Section.
2. Coordinate with sewer district for discharge of water used for disinfection and flushing. De-chlorinate if required and pay discharge permit fees if required by sewer district.

E. SCHEDULING

1. Schedule work under the provisions of Division 01.

F. REFERENCES

1. AWWA B300 - Hypochlorites; American Water Works Association; 2004 (ANSI/AWWA B300).
2. AWWA B301 - Liquid Chlorine; American Water Works Association; 2004 (ANSI/AWWA B301).
3. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 2005 (ANSI/AWWA C651).

G. SUBMITTALS

1. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements from California Department of Public Health.
2. Disinfection Report:
   a. Type and form of disinfectant used.
   b. Date and time of disinfectant injection start and time of completion.
   c. Test locations.
   d. Initial and 24-hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
   e. Date and time of flushing start and completion.
   f. Disinfectant residual after flushing in ppm for each outlet tested.

H. QUALITY ASSURANCE

1. Perform work in accordance with AWWA C651.
2. Testing Firm: Company specializing in testing potable water systems.

3. Perform entire disinfection procedure under supervision of County's Construction Manager or authorized representative.

PART 2 PRODUCTS

A. DISINFECTION CHEMICALS

1. Aqueous solution of sodium hypocholorite (minimum 5.25% available chlorine).
2. Use of powdered hypocholorite and chlorine gas are prohibited unless specifically approved by Mono County Health Department.

PART 3 EXECUTION

A. EXAMINATION

1. Verify that piping system has been cleaned, inspected, and pressure tested.
2. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.
3. Service Valve: Provide within 3' of the entrance of the supply main to the building, a 3/4" service valve, for the purpose of introducing the disinfecting agent into the lines.
4. Flushing: After final pressure tests and before draining for disinfection, open each fixture or outlet until the water flow is clear.

B. EXECUTION

1. Provide and attach required equipment to perform the work of this Section.
2. Drain entire domestic water system including fire line.
3. Post suitable warning signs at each outlet: Warning - Do Not Use - Water System Being Chlorinated.
4. Inject disinfectant solution into the system through the service valve by means of a pump, or other pressure device, at a slow continuous rate, simultaneous with a reduced flow from the water main, until the orthotolidine test for residual chlorine at each outlet shows a concentration of at least 50 ppm but note more than 100 ppm.
5. Close all outlets and valves, including the service valve at the main and the injection valve. Retain the chlorinated water in the system for 24 hours.
6. After the 24-hour holding period, the residual chlorine concentration shall be not less than 50 ppm as shown by the orthotolidine test.
7. Drain and flush entire domestic water system until orthotolidine tests show background residual chlorine concentration at any outlet.
8. The Mono County Health Department will determine whether samples of water must be collected and analyzed for the determination of bacteriological quality.

C. FIELD QUALITY CONTROL

1. Test samples in accordance with AWWA C651.
2. The water system shall have been uniformly chlorinated as outlined in the Execution Section above.
3. The results of water sample analysis shall be negative for the Coliform organisms.
4. If the test for the bacteriological quality of the water in the system does not meet the

standards, repeat the disinfection procedure until the specified standards are met.

5. Final Approval: The Mono County Health Department will give written approval to the County for acceptance and use of the water system after the above procedures have been successfully completed and the standards met.

END OF SECTION

SECTION 33 31 00

SANITARY SEWERAGE PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe and fittings for sanitary sewer.

B. Manhole, manhole rim and cover.

C. Sewer cleanout, box and cover.

D. Grease trap.

E. Sand/Oil separator.

1.2 RELATED SECTIONS

A. Section 31 22 00 - Grading

B. Section 32 23 16.13 Trenching

1.3 REFERENCE STANDARDS

A. Geotechnical Investigation – See Information Available to Bidders.

B. ASTM D3350-21 Specification for Polyethylene Plastics Pipe and Fittings Materials

C. ASTM F714 Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

1.4 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, and accessories.

B. Manufacturer’s Certificate: Certify that products meet or exceed specified requirements.

C. Project Record Documents: Record actual locations of piping mains, connections, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

D. Sewer Compliance Certificate: Provide Certificate of Sewer Compliance from Mono County.

1.5 QUALITY ASSURANCE AND CONTROL

A. Perform work in accordance with Mono County Standards and Caltrans Standard Specifications.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store pipe and fittings in shipping containers with labeling in place.

B. Pipes, fittings, and appurtenances shall be new, free of defects and meet or better industry standards.

1.7 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 01.

1.8 SCHEDULING

A. Schedule work under the provisions of Division 01.

PART 2 PRODUCTS

2.1 SANITARY SEWER PIPE

A. PVC SDR 35: Nominal diameter as indicated on Contract Drawings.

B. Marking and Location Wire: Underground marking tape and location wire shall be installed according to the manufacturer's instructions and as shown on the Drawings. Marking tape shall be detectable aluminum foil marking tape with a nylon encasement. Tape shall be 3 inches wide and bear the following in large printing: "BURIED SEWER LINE BELOW". Location wire shall be solid 12 gauge insulated copper wire. Marking tape and location wire shall extend into all valve boxes with 2 feet minimum free and accessible from the valve box cover. Marking tape and location wire shall be continuous between valves and appurtenances. Free ends resulting from breaks in the tape or at the beginning of a new roll shall be joined together to form a continuous connection. Location wire shall be adequately spliced together at free ends to ensure a positive watertight electrical connection.

2.2 SANITARY SEWER MANOLE

A. Pre-cast manhole base, manhole barrels, cone and grade rings as manufactured by Jensen Precast or approved equivalent.

B. Watertight pipe connections.

C. Cast iron frame and covers “Mono County”.

2.3 SANITARY SEWER CLEANOUT

A. Traffic rated cast-iron cleanout body and cover for “Sewer” or Christy G5 valve box or approved equivalent for 4” PVC cleanout pipe.

2.4 GREASE TRAP

A. Pre-cast as manufactured by Jensen Precast or approved equivalent.

B. Watertight pipe connections.

C. Cast iron frame and covers “Mono County”.

2.5 SAND/OIL TRAP

A. Pre-cast as manufactured by Jensen Precast or approved equivalent.

B. Watertight pipe connections.

C. Cast iron frame and covers “Mono County”.

2.6 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 32 23 16.13 Trenching

B. Cover: As specified in Section 32 23 16.13 Trenching

2.7 ACCESSORIES

A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

B. Marking and Location Wire: Underground marking tape and location wire shall be installed according to the manufacturer's instructions and as shown on the Drawings. Marking tape shall be detectable aluminum foil marking tape with a nylon encasement. Tape shall be 3 inches wide and bear the following in large printing: "BURIED SEWER LINE BELOW". Location wire shall be solid 12 gauge insulated copper wire. Marking tape and location wire shall extend into all valve boxes with 2 feet minimum free and accessible from the valve box cover. Marking tape and location wire shall be continuous between valves and appurtenances. Free ends resulting from breaks in the tape or at the beginning of a new roll shall be joined together to form a continuous connection. Location wire shall be adequately spliced together at free ends to ensure a positive watertight electrical connection.

C. Sewer Cleanout: In accordance with County requirements.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that service connection and pipeline size, location, and invert are as indicated on Contract Drawings.

B. Cut pipe ends square, ream pipe and tube ends to full pipe diameter; remove burs.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare pipe connections to equipment with flanges or unions.

3.2 TRENCHING

A. See related sections for additional requirements.

1. Section 31 22 00, Grading
2. Section 32 23 16.13 Trenching

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Backfill around sides and top of pipe with bedding material, tamp in place and compact, then complete backfilling.

3.3 PIPE INSTALLATION

A. Maintain separation of sewer main from other utilities as required by codes.

B. Group piping with other site piping work whenever practical.

C. Establish elevations of buried piping to ensure required minimum depth of cover.

D. Install pipe to indicated elevations to within tolerance of 1/4 inches.

E. Route pipe in straight line.

F. Install pipe to allow for expansion and contraction without stressing pipe or joints.

G. Slope sewer pipe and position drains to low points.

H. Install location wire 0 inches above top of pipe; coordinate with Section 02317, Trenching for Site Utilities.

3.4 FIELD QUALITY CONTROL

A. The Contractor shall:

1. Cooperate with the County's Construction Manager in all aspects of the work.
2. Notify the County's Representative and the County's Construction Manager at least four (4) working days prior to required observation or testing.
3. Be responsible for expense of all retesting or other controlled material found to be inadequate at first testing, including fees for travel, personnel time, laboratory expenses, office work, supervision, and testing which may be incurred by reason of such retesting. The County's Representative will deduct such expenses from monies due the contractor under the contract.

END OF SECTION

SECTION 33 42 11

STORMWATER GRAVITY PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Storm drainage piping, fittings, and accessories.

B. Precast drain inlets.

1.2 RELATED SECTIONS

A. Section 31 22 00 - Grading

B. Section 32 23 16.13 - Trenching

1.3 REFERENCE STANDARDS

A. ASTM D2241-20 Standard Specification for Poly Vinyl Chloride (PVC) Pressure Rated Pipe (SDR Series).

B. ASTM D2564-20 Standard Specification for Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Piping Systems.

C. ASTM D2321-20 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

D. ASTM D3034-21 Standard Specification for Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings

1.4 SUBMITTALS

A. Product Data: Provide data indicating pipe and pipe accessories.

B. Manufacturer’s Installation Instructions: Indicate special procedures required to install products specified.

C. Precast drain inlet manufacturer’s cut sheets.

D. Project Record Documents: Record location of pipe runs, connections, drain inlets, and invert elevations.

E. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE AND CONTROL

A. Perform work in accordance with Mono County Standards and Caltrans Standard Specifications.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store pipe and fittings in shipping containers with labeling in place.

B. Pipes, fittings, and appurtenances shall be new, free of defects and meet or better industry standards.

1.7 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 01.

1.8 SCHEDULING

A. Schedule work under the provisions of Division 01.

PART 2 PRODUCTS

2.1 STORM SEWER PIPE MATERIALS

A. Storm Drain Pipe: PVC SDR 35, nominal diameter as indicated on Contract Drawings.

2.2 DRAIN INLET

A. Pre-cast drain inlet Caltrans G0 curb inlet A1-6 (6” curb) as manufactured by Jensen Precast or approved equivalent.

B. Watertight pipe connections.

2.3 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 32 23 16.13 Trenching

B. Cover: As specified in Section 32 23 16.13 Trenching

2.4 ACCESSORIES

A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

B. Marking Tape and Location Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "STORM SEWER SERVICE" in large letters.

C. Drain Rock: 3/4-inch crushed rock.

PART 3 EXECUTION

3.1 TRENCHING

A. See related sections for additional requirements.

1. Section 32 23 16.13 Trenching

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Backfill around sides and top of pipe with bedding material, tamp in place and compact, then complete backfilling.

3.2 PIPE INSTALLATION

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on Contract Drawings.

B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions.

1. Plastic Pipe: Also comply with ASTM D 2321-20.
2. Seal installations watertight.

C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Install marking tape 6 inches above top of pipe; coordinate with Section 32 23 16.13 Trenching.

3.3 DRAIN INLET INSTALLATION

A. Form bottom of excavation. Clean and smooth to correct elevation. Bottom of excavation shall be 12 inches below invert of drain inlet.

B. Place 12 inches of drain rock.

C. Install precast drain inlet per manufacturer’s instructions.

D. Place 3/4-inch drain rock at outside of drain inlet to 6 inches above drain inlet invert.

E. Form and place precast concrete drain inlet with provisions for drain pipes.

F. Establish elevations and pipe inverts for inlets and outlets as indicated.

G. Provide watertight connections at pipe connections.

3.4 FIELD QUALITY CONTROL

A. The Contractor shall:

1. Cooperate with the County’s Construction Manager in all aspects of the work.
2. Notify the County’s Representative and the County’s Construction Manager at least four (4) working days prior to required observation or testing.
3. Be responsible for expense of all retesting or other controlled material found to be inadequate at first testing, including fees for travel, personnel time, laboratory expenses, office work, supervision, and testing which may be incurred by reason of such retesting. The County’s Representative will deduct such expenses from monies due the contractor under the contract.

3.5 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 47 26.16

RETENTION BASIN AND BIOSWALE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Stormwater retention basin and snow storage areas.

B. Bioswale and channels.

C. Areas to receive revegetation treatments shall include all areas disturbed during construction except for areas to be landscaped as included elsewhere in these specifications. Any alterations in materials or methods from those specified in this document shall be subject to review and approval by the Engineer prior to their use. All required certificates and samples shall be submitted prior to performing soil conditioning and revegetation treatments.

1.2 RELATED SECTIONS

A. Section 31 22 00 - Grading

B. Section 32 92 13 - Hydroseeding

1.3 REFERENCE STANDARDS

A. Caltrans Section 21 Erosion Control

1.4 SUBMITTALS

A. Seed mixes.

B. Erosion control blanket manufacturer cut sheet.

C. Hardwood stakes cut sheet.

1.5 QUALITY ASSURANCE AND CONTROL

A. Perform work in accordance with Mono County Standards and Caltrans Standard Specifications.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Products shall be protected from damage at all times to be installed as specified.

1.7 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 01.

1.8 SCHEDULING

A. Schedule work under the provisions of Division 01.

PART 2 PRODUCTS

2.1 EROSION CONTROL BLANKET

A. North American Green C125BN or approved equivalent.

2.2 STAKES

A. Hardwood.

2.3 SEED

A. For seed mix requirements see elsewhere in these specifications.

PART 3 EXECUTION

3.1 EXCAVATION AND PREPARATION

A. Excavate basins and drainage channels as indicated on the Drawings.

B. Grade to lines and grades and spread soil amendments.

C. Till soil and incorporate amendments to depth of 4" – 6".

D. Refer to the plans for additional information.

3.2 SEEDING

A. Seeding shall be conducted in the fall prior to snow accumulation and ground freeze unless otherwise approved by the Engineer. Soils shall be moist to two inches and seed shall not be planted unless the seed mix and soil preparation activities have been approved by the Engineer.

B. Revegetation order. The revegetation process shall occur in the following order:

1. Spread soil amendments.
2. Till soil and incorporate amendments to a depth of 4 inches to 6 inches.
3. Seed Mix shall be applied by hand or hand applicator at the rates listed above. Seed mix shall be spread in a uniform manner.
4. Following seed application, the soil surface shall be very lightly raked so the seeds are placed to a depth of one-quarter to one-half inch (¼ - ½").
5. Erosion control blanket (North American Green C125BN or equivalent) shall be installed using the fabric or blanket staking frequency called for by the manufacturer.

C. Contractor shall use fiber rolls as indicated on the plans as well as any additional measures necessary to limit erosion and the transport of sediment. Stormwater shall not be allowed to flow across unstable construction materials.

3.3 TEMPORARY IRRIGATION

A. Provide temporary irrigation until seeded vegetation is established and until start of the rainy season.

3.4 FIELD QUALITY CONTROL

A. The Contractor shall:

1. Cooperate with the County's Construction Manager in all aspects of the work.
2. Notify the County's Representative and the County's Construction Manager at least four (4) working days prior to required observation or testing.
3. Be responsible for expense of all retesting or other controlled material found to be inadequate at first testing, including fees for travel, personnel time, laboratory expenses, office work, supervision, and testing which may be incurred by reason of such retesting. The County's Representative will deduct such expenses from monies due the contractor under the contract.

3.5 PROTECTION

A. Protect erosion control blanket from damage or displacement.

END OF SECTION

SECTION 33 79 16.13

COMMUNICATIONS TOWER AND SHELTER GROUNDING

PART 1 GENERAL

1.1 SUMMARY

A. These specifications include the requirements for furnishing and installing a grounding system for the new communications tower and shelter at the Mono County Jail site.

B. It is the intent of this Specification to provide for a complete, integrated, working system. Inadvertent omission of any necessary items of work, material, or equipment shall not negate the Contractor's responsibility to provide those items.

C. Provide all labor, materials, appliances, tools, equipment, facilities, transportation, and services necessary for or incidental to performing all operations of the Work of this Specification, complete, as specified herein.

D. Furnish, and install all necessary conductors, clamps, ground rods, bus bars, et al to create a fully installed grounding system.

E. Install Buried Ground Rings (BGR) around the Shelter and the Tower and bond them together.

F. Bond the tower and shelter to the ground ring per Sheet T.EY111.

G. Bond all metallic objects with 20’ of the tower and 6’ of the BGR to the BGR.

1.2 QUALITY OF WORK

A. All equipment, material, and articles incorporated in the work covered by this contract are to be new and of the most suitable grade for the purpose intended. All work under this contract shall be performed in a skillful and workmanlike manner.

B. Engineer shall have the right to reject any equipment based on an integral part that he or she deems to be substandard.

1.3 SUBMITTALS

A. General

1. Ten copies of all submittals shall be submitted to the architect, engineer, and owner for review.
2. All references to the manufacturer’s model numbers and other pertinent information herein are intended to establish minimum standards of performance, function, and quality.
3. Equivalent compatible equipment from other manufacturers may be considered as a substitution for the specified equipment as long as the minimum standards are met.
4. Substitute equipment proposed as equal to the equipment specified herein shall meet or exceed the minimum specified standard. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. As-Built Drawings

1. Vendor shall provide all as-built drawings, complete with all final design calculations for the tower structure and the foundation.

C. Specifications

1. NFPA 70, *Chapter 8 Communications Systems*
2. NFPA 70, Article 250 *Grounding and Bonding of Electrical Systems*
3. ATIS 06000334 (2013) *Electrical Protection of Communication Towers and Associated Structures*
4. ATIS 0600333 13th Edition (2018) *Grounding and Bonding of Telecommunications Equipment*
5. ATIS 0600313 (2013) *Electrical Protection for Telecommunications Central Offices and Similar Type Facilities*

PART 2 PRODUCTS

2.1 SYSTEM OVERVIEW

A. Two (2) Buried Ground Rings bonded together, each circling the Communications Shelter and the Communications Tower.

B. Bonding conductors from the tower to its BGR and the shelter to its BGR.

C. Bus bars on the base of the cable ladder on the tower and the shelter underneath the cable entry port are each bonded to the BGR.

D. Stranded conductors are only allowed inside buildings, all above and below-ground conductors shall be solid unless the bonding involves a moving element such as a gate.

E. Aluminum conductors shall not be used.

F. The BGR shall be a minimum of 36” away from the shelter and a minimum of 24” away from the tower foundation.

2.2 SYSTEM COMPONENTS

A. #2 bare, tinned solid copper conductors.

B. Exothermically welded connectors

C. Ground rods, 10 mil copper plated 5/8” diameter steel with threaded ends, Eritech model #615800 or approved equivalent.

D. GAR type connectors, Burdy, or approved equivalent.

2.3 SYSTEM CONFIGURATION

A. The BGR shall be buried a minimum of 30” below grade or frost line, whichever is deeper, and use a #2 bare, tinned, solid copper conductor.

B. Ground rods shall be located along the BGR in 6’ to 10’ intervals, at the location where the grounding conductor meets the BGR, at locations where each down conductor meets the BGR, and at any other location where a grounding conductor meets the BGR.

C. Ground rods shall be driven into the ground such that the top of the rods are at the level of the BGR.

D. Ground rods shall be connected to the BGR using Exothermic Welds only. Screw clamp connectors shall not be used at any time.

E. The bond-derived ground of Isolating Transformer to the BGR with a minimum #2 bare, tinned, solid copper conductor.

F. Coordinate the location of bonding conductors with the shelter and tower layouts.

G. Bond shelter skids to BGR at all grounding points provided by the manufacturer.

H. Bond each tower leg to two locations along the BGR.

I. Bond down conductors exiting the corners of the shelter to the BGR.

J. Bond two down conductors from the PBB and exit the east wall of the shelter to the BGR.

PART 3 EXECUTION

3.1 GENERAL

A. Installation Conditions and Requirements

1. Verbal statements by or opinions of Mono County relating to the existing system, site conditions, and installation conditions and requirements will not be considered binding.
2. The Contract Drawings indicate the general arrangement of circuits, conduit runs, equipment racks, antennas, transmission line runs, and other work. The information shown on the Contract Drawings is schematic; however, reconfiguration will not be permitted without specific acceptance.
3. Data presented on the Contract Drawings is as accurate as planning can determine, but accuracy is not guaranteed and field verification of all dimensions, locations, levels, etc., to suit field conditions is required.
4. The contractor shall review all Contract and Reference Drawings, and Specification and adjust all work to conform to all conditions shown therein.

3.2 WIRING AND WIRING PRACTICES

A. All grounding shall meet TIA J-StO-607-A Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications and ANSI/ATIS 0600333-2013 – Grounding and Bonding of Telecommunications Equipment.

B. Before burial, the BGR will be inspected by the owner engineer to ensure all connections are correctly made.

3.3 FINAL ACCEPTANCE

A. Final acceptance of the system shall consist of successful completion of all inspections, submittal by the Contractor of all as-built drawings and other documentation, completion of Contractor-provided correction of all deficiencies, and final clean-up of the installation site.

END OF SECTION

SECTION 33 81 16

LATTICE COMMUNICATIONS TOWER

PART 1 GENERAL

1.1 SUMMARY

A. These specifications include the requirements for furnishing and installing a 60’ lattice tower at the Mono County Jail site as shown in the site layout.

B. This section specifies the tower and cable bridge supporting the cables from the shelter. Please refer to Section 33 79 16.13 for details regarding the grounding and bonding of the tower and the cable bridge.

C. Provide all labor, materials, appliances, tools, equipment, facilities, transportation, and services necessary for or incidental to performing all operations of the Work of this Specification, complete, as specified herein.

D. Furnish, and install all necessary hardware to provide a finished communications tower supporting all cables and antennas, including a climbing ladder, safety climb system, cable ladder, and tower foundation.

1.2 QUALITY OF WORK

A. All equipment, material, and articles incorporated in the work covered by this contract are to be new and of the most suitable grade for the purpose intended. All work under this contract shall be performed in a skillful and workmanlike manner.

B. Engineer shall have the right to reject any equipment based on an integral part that he or she deems to be substandard.

1.3 SUBMITTALS

A. General

1. Ten copies of all submittals shall be submitted to the architect, engineer, and owner for review.
2. All references to the manufacturer’s model numbers and other pertinent information herein are intended to establish minimum standards of performance, function, and quality.
3. Equivalent compatible equipment from other manufacturers may be considered as a substitution for the specified equipment as long as the minimum standards are met.
4. Substitute equipment proposed as equal to the equipment specified herein shall meet or exceed the minimum specified standard. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. As-Built Drawings

1. Vendor shall provide all as-built drawings, complete with all final design calculations for the tower structure and the foundation.

C. Specifications

1. ANSI/TIA-222-H or latest revision

2. IEEE Std 81
3. FAA Advisory Circular #AC 70/7460-1L latest edition
4. FCC Rules and Regulations, Part 17, Construction, Marking, and Lighting of Antenna Structures

1.4 WARRANTY

A. Except as otherwise expressly provided in this Contract, the Contractor shall remedy at his own expense any failure of the Work for a period of one year to conform to Contract Specifications.

B. Failure of work includes any defect of material, workmanship, or design in the Work (but excluding any defect of any design furnished by Mono County under this Contract) provided that the Contracting Officer or the Authorized Representative gives the Contractor notice of any such failure or defect promptly after discovery but not later than 1 year after final acceptance of the Work.

C. In the case of defects or failures in a part of the Work of which Mono County takes possession prior to final acceptance, such notice shall be given not later than one year from the date Mono County takes such possession.

D. The Contractor, at his own expense, shall also remedy damage to equipment, the site, or the buildings or the contents thereof, which is the result of any failure or defect, and restore any Work damaged in fulfilling the terms of this article.

E. Should the Contractor fail to remedy any such failure or defect within a reasonable time after receipt of notice thereof, Mono County shall have the right to replace, repair, or otherwise remedy such failure or defect at the Contractor's expense. This warranty shall not delay the final acceptance of or final payment for the Contract Work.

PART 2 PRODUCTS

2.1 SYSTEM OVERVIEW

A. One 60’ tall, 3-legged lattice communications tower is to be provided and installed per the site layout diagram.

B. Provide and install a cable bridge, consisting of one or more 10’ long sections running from the cable entry port of the Communications Shelter to the base of the cable ladder on the tower.

C. Engineer, provide, and install tower and cable bridge foundations.

2.2 SYSTEM COMPONENTS

A. One (1) 60’ 3-legged lattice tower, designed to EIA-222-H specifications or newer release if one becomes available, Valmont Model Number 72-V960-60, Quote Number 545533, or approved equivalent. The design shall be based on 150 sq ft windloads at 60’, 50’, and 40’ per the quote.

1. Grounding tabs at the base of each leg
2. 14-hole vertical waveguide ladder on the outside of one tower face
3. Step bolts provided on one leg

4. Inside the climbing ladder in one tower corner with safety climb cable system and climb cable sleeve.
5. 5/8” x 4’ galvanized lightning rod with 15’ extension
6. Anchor Bolts and Placing Template
7. Stamped Foundation Design by CA PE
8. Stamped Structural Analysis by CA PE

B. One (1) 24” Grip-Span Ice Bridge Kit with Triple Tee Trapeze, Valmont model number IB24D-T3, length based on distance from shelter to tower.

C. 18” long Tinned, copper grounding Bus Bar at the bottom of the cable bridge, Valmont model TINMG418U-K or approved equivalent.

D. Concrete for foundation per foundation design.

E. All fabrication, erection, and identification of structural steel shall conform to AISC specifications.

F. Under no circumstances shall "dissimilar metals" be used in contact with one another.

G. Tubular sections shall be hot-dip galvanizing inside and outside per standards and methods listed elsewhere in this specification.

H. Welding processes and welding operators shall be qualified in accordance with AWS "Standard Qualification Procedure”. All welders shall be certified per AWS D1.1.

I. Materials shall be properly marked and match-marked for field assembly. All material shall be fabricated for a delivery sequence which shall expedite erection and minimize field handling of materials.

J. The tower shall be provided with a cap plate at the top of each tower leg to reduce the infiltration of water.

K. The tower shall be provided with drain plates beneath each tower leg base for the removal of water and condensation from the interior of the tower.

L. No field welding shall be permitted unless specifically approved in writing by both the Tower Manufacturer and the County Project Manager.

M. All members shall be connected with galvanized structural bolts conforming to ASTM A325 unless otherwise approved by the Authority having Jurisdiction.

N. The vendor shall provide bolts, nuts, lock nuts, and lock washers in a quantity in excess of the actual bolt count, for each size required for the tower. Any shortages shall be immediately replaced by the vendor.

Bolt Count	Percentage Excess	Minimum Excess
0-200	5%	1 Bolt
200-500	4%	10 Bolts
500-1000	3%	20 Bolts
1000+	2%	30 Bolts

O. The tower shall be provided with the correct size and length of anchor bolts necessary to carry the anticipated tower loads. Tower anchor bolts shall have an embedded steel template at the bottom of each group of anchor bolts.

P. All threaded fasteners shall extend not less than 1-1/2 threads beyond nuts and locking devices.

Q. ANCO™-type lock nuts shall be used on all structural connections. Lock washers may be used only on non-structural connections such as ladder brackets and U-bolts.

R. Anti-fall devices, meeting the latest requirements of Oregon OSHA shall be provided.

S. Tower climbing ladders shall have a horizontal step rung width of 16 inches. The minimum diameter of the step rungs shall be 3/4 inch. Rungs shall support concentrated loads of 250 pounds. The maximum allowable spacing of the rungs shall be 12 inches. 7 inches of clear space behind the ladder is required.

T. All steel members and fasteners shall be hot-dip galvanized (zinc coated) per standards in this specification.

U. Under no circumstances shall any coating on any metal member or fastener be cathodic relative to the base material.

V. Use "Devcon ®", or equivalent, zinc-rich paint, or County approved equal, to touch up damaged galvanizing. Touch-ups may be done by either a spray or brush application.

2.3 SYSTEM CONFIGURATION

A. Reference the Valmont Quote 545533 for tower configuration.

B. Reference Valmont Quote 545533 for the Preliminary Foundation design for foundation configuration.

PART 3 EXECUTION

3.1 GENERAL

A. Installation Conditions and Requirements

1. Verbal statements by or opinions of Mono County relating to the existing system, site conditions, and installation conditions and requirements will not be considered binding.
2. The Contract Drawings indicate the general arrangement of circuits, conduit runs, equipment racks, antennas, transmission line runs, and other work. The information shown on the Contract Drawings is schematic; however, reconfiguration will not be permitted without specific acceptance.
3. Data presented on the Contract Drawings is as accurate as planning can determine, but accuracy is not guaranteed and field verification of all dimensions, locations, levels, etc., to suit field conditions is required.
4. The contractor shall review all Contract and Reference Drawings, and Specification and adjust all work to conform to all conditions shown therein.

3.2 TOWER LOCATION AND ORIENTATION

A. The Contractor shall field verify the actual location and tower orientation prior to commencing work.

3.3 ERECTION AND INSTALLATION

A. Tower erection shall be in strict accordance with the manufacturer's recommendations. The tower erector shall be responsible for the design and erection of temporary bracing and shoring as may be required until all members are in place and secured to form a self-supporting unit.

B. After the materials have been unloaded, the Contractor shall inventory all parts per the bill of material and immediately report any shortages or damage to the County. Any missing or damaged parts shall be replaced by the contractor before the tower erection begins.

C. Contractor shall train his employees in the proper use of the tooling and shall 'qualify' each installer before permitting that employee to work on jobs covered by this contract.

D. Excavation spoils shall be transported to an approved landfill on the attached list of approved landfills.

E. The County will hire and assign a special inspector to test both concrete and tower bolts.

F. Contractor shall coordinate concrete and bolt testing with the assigned special inspector.

G. Tower sections and other materials that require a crane to lift them shall be provided by the contractor.

H. Contractor shall remove and dispose of all dunnage following each delivery.

I. Contractor shall perform a daily cleanup of the site during construction.

J. Contractor shall provide portable toilet facilities on-site during construction.

3.4 FINALIZATION

A. Contractor shall remove all debris and equipment from the tower installation site upon completion of tower installation, and restore the site.

B. County representative shall perform a final walk-through with the Contractor and generate a project punch list.

C. Contractor shall correct all defects and omissions noted on the punch list.

D. Final as-built drawings reflecting this project as installed shall be provided in both plotted (24" x 36" minimum, 10 copies) and electronic format, .dxf, and .dwg, 4 copies on CDs.

E. Four (4) sets of manuals for all equipment shall be provided.

F. Contractor shall provide a 20-year warranty for all materials and workmanship on the tower and all tower appurtenances.

END OF SECTION

SECTION 33 81 29

COMMUNICATIONS SHELTER

PART 1 GENERAL

1.1 SUMMARY

A. These specifications include the requirements for furnishing and installing a radio system to provide communications for both staff members and first responders within the Mono County Jail associated with this project.

B. It is the intent of this Specification to provide for a complete, integrated, working shelter. Inadvertent omission of any necessary items of work, material, or equipment shall not negate the Contractor's responsibility to provide those items.

C. Provide all labor, materials, appliances, tools, equipment, facilities, transportation, and services necessary for or incidental to performing all operations of the Work of this Specification, complete, as specified herein.

1.2 QUALITY OF WORK

A. All equipment, material, and articles incorporated in the work covered by this contract are to be new and of the most suitable grade for the purpose intended. All work under this contract shall be performed in a skillful and workmanlike manner.

B. Engineer shall have the right to reject any equipment based on an integral part that he or she deems to be substandard.

C. All cabling shall be appropriately labeled.

1.3 SUBMITTALS

A. General
   1. Ten copies of all submittals shall be submitted to the architect, engineer, and owner for review.
   2. All references to the manufacturer’s model numbers and other pertinent information herein are intended to establish minimum standards of performance, function, and quality.
   3. Equivalent compatible equipment from other manufacturers may be considered as a substitution for the specified equipment as long as the minimum standards are met.
   4. Substitute equipment proposed as equal to the equipment specified herein shall meet or exceed the minimum specified standard. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

1.4 WARRANTY

A. Furnish all system support and all warranty maintenance and repairs required to operate the Mono County Jail communication system. Provide the specific warranty and support provisions for the Mono County DAS communication system as specified in this Section.

B. Except as otherwise expressly provided in this Contract, the Contractor shall remedy at his own expense any failure of the Work for a period of one year to conform to Contract Specifications.

C. Failure of work includes any defect of material, workmanship, or design in the Work (but excluding any defect of any design furnished by Mono County under this Contract) provided that the Contracting Officer or the Authorized Representative gives the Contractor notice of any such failure or defect promptly after discovery but not later than 1 year after final acceptance of the Work.

D. In the case of defects or failures in a part of the Work of which Mono County takes possession prior to final acceptance, such notice shall be given not later than one year from the date Mono County takes such possession.

E. The Contractor, at his own expense, shall also remedy damage to equipment, the site, or the buildings or the contents thereof, which is the result of any failure or defect, and restore any Work damaged in fulfilling the terms of this article.

F. Should the Contractor fail to remedy any such failure or defect within a reasonable time after receipt of notice thereof, Mono County shall have the right to replace, repair, or otherwise remedy such failure or defect at the Contractor's expense. This warranty shall not delay the final acceptance of or final payment for the Contract Work.

PART 2 PRODUCTS

2.1 SYSTEM OVERVIEW

A. One (1) 12’ x 15’ manufactured building (“Communications Shelter”) is completely built and equipment ready.

B. Three (3) 90” tall, welded steel, 19” EIA racks with yellow zinc chromate finish.,

C. (2) HVAC split units, with lead-lag control

D. Foundation for Shelter

2.2 SYSTEM COMPONENTS

A. One (1) manufacturer communications shelter, Thermobond model TBD317 or approved equivalent.

1. The shelter shall be 12’ wide O.D. x 15’ long O.D. x 9’ high I.D,
2. The minimum R-Values in the floor, walls, and roof shall be R-15 in the walls & floor and R-30 in the roof.
3. The minimum floor loading shall be 200 pounds per square foot.
4. The minimum roof loading shall be 150 pounds per square foot.
5. The minimum roof impact resistance shall be 220 pounds with no visible damage to either the exterior or interior of the roof or shelter.
6. The minimum roof impact resistance shall be 220 pounds with no visible damage to either the exterior or interior of the roof or shelter.

7. The minimum roof impact resistance shall be 220 pounds with no visible damage to either the exterior or interior of the roof or shelter.
8. The skid assembly for the shelter shall have a minimum of two 6" x 9 lb. beams with 3½" O.D. pipes running through the beams and welded into place. 2" x 2" x ¼" angles shall be placed between the beams every 4' O.C. The complete skid assembly shall be galvanized and secured to the finished sub-floor with high-strength 3" lag bolts.
9. A typical floor system shall be comprised of wood floor joists, one layer of ¾" CDX plywood (exterior side), and one layer of ¾" tongue and groove plywood (interior side) with a minimum R-11 fiberglass batt insulation. Before the floor assembly is attached to the skid assembly and the installation of the rodent shield mesh, the underside of the floor assembly shall be treated with an application of a coat of penetrating liquid bituminous sealer.
10. The complete underside of the floor assembly shall be covered with a 16-mesh .011 wire mesh rodent shield before the floor assembly is attached to the skid assembly.
11. The interior surface of the shelter floor shall be covered with a 1/8" commercial grade vinyl tile. The perimeter is finished with a 4" cove base. All material is secured with commercial-grade adhesive.
12. The roof system shall be comprised of wood roof joists, one layer of ¾" CDX plywood (exterior side), and one layer of 5/8" OSB with laminated FRP (interior side) with minimum R-19 fiberglass batt insulation.
13. The exterior of the roof shall be covered with a commercial grade 45 mil reinforced TPO roofing membrane secured in place with a commercial grade bonding adhesive. All seams are heat welded. A dark bronze metal roof edge shall cover the perimeter of the roof. The roof shall be sloped from the center to the sides to provide proper drainage.
14. The interior walls and ceiling shall be covered with ¾" prefinished FRP/OSB board.
15. The exterior walls of the shelter shall be natural stone aggregate panels with a color gray.
16. The interior core of the walls, roof, and floor shall be filled with a minimum of R-11 & R-19 fiberglass batt insulation.
17. At all points on the exterior of the shelter where two pieces of material come together, butt against each other, overlap each other or are fastened one to the other, the seam shall be sealed with an industrial-grade poly-urethane sealer during and after the final assembly to insure water tight joints.
18. The door shall be a 3' x 7' commercial-grade insulated fiberglass door. The door hinges shall be heavy-duty stainless-steel ball-bearing hinges with non-removable pins. The door shall be equipped with:
    - a heavy-duty commercial-grade deadbolt lock
    - passage
    - threshold
    - weather-stripping
    - interior pull handle to make a complete air-tight assembly
    - hydraulic closer with hold open stop arm
    - electric strike with latch guard
    - door contact
19. The shelter manufacturer shall design the shelter's foundation by a civil engineer registered in California. The contractor shall provide and install the foundation per the design.

B. Shelter Electrical Systems: All wiring shall be surface mounted in raceway or EMT conduit using approved connectors, couplings, and clamps. All flex conduits are to be sealed tight type. Wire-way, conduit, and/or drop box will be properly de-rated for compliance with the current adopted edition of the NEC code. All C wiring shall be a solid conductor, THHN or THHN copper, no smaller than #12. All wire runs shall be continuous. All DC wiring shall be TelcoFlex or approved equivalent. All breakers, wires, boxes, conduit, etc. to make a complete assembly

C. The proposed shelter shall be equipped with the following electrical items:

1. (1) Integrated Load Center w/MTS, ATS, 40 space load center and TVSS, EEE Co model TSA200-2HH3FF-234S-3309P01VL or approved equivalent
2. (6) 4', 2 bulbs LED light fixtures, 36W each, associated light switch
3. (1) Vandal-proof 10W LED exterior light fixture with photocell and switch
4. (2) HVAC 2 Ton Split-Units, Mitsubishi model numbers PUZ-A24NHA7-BS (outdoor unit) and PKA-A24KA7 (indoor wall-mount unit) or approved equivalent
5. (2) Heavy-duty stainless-steel wall mounts for the outdoor HVAC unit, Mitsubishi model number QSWBSS or approved equivalent
6. (1) HVAC Controller, Mitsubishi model number PAR-33MAA or approved equivalent; the controller shall be configured to work as a lead-lag controller per Mitsubishi Application Note 3024.
7. (1) Alarm interface, Mitsubishi model number PAC-715AD
8. (3) Quad 5-20R receptacles
9. (1) GFI 5-20R dual receptacle with a weatherproof cover
10. (2) L5-20 20A twistlock outlets over each rackspace.
11. (3) Split bus 14 position DC Circuit Breaker Panel, Lamarche model number BPV19-48V-14R-X or approved equivalent, one at the top of each County rack.
12. 4" Raceway
13. Smoke Detector with dry contact closure output
14. (1) Type 66 Punch Block for alarm connections

D. Other Equipment

1. (5) Steel welded 19" EIA rack, 90" tall, yellow zinc finish, 3 holes per RU; B-Line model SB506090XU-YZ or approved equivalent
2. (4) Vertical Cable Management channels, BLine model SB572084YZ or approved equivalent.
3. 24" Cable Tray, gold chromate finish, length as required per drawing, including supports and fasteners, B-Line model number SB17T24YZ or approved equivalent
4. (2) 20" Master Ground Bars with mounting kit, Valmont model MG420U-K or approved equivalent
5. (1) 20" Exterior Ground Bar, Hot Dipped Galvanized steel with insulators & brackets, 52 holes, universal hole pattern, Valmont model number TINMG420U-K or approved equivalent
6. (1) Cable Entry Port panel, 4" ports, 2x4 ports, Valmont model number E576 or approved equivalent with caps.

7. (1) Boot for 5/8" Coaxial cable entry, Valmont model SRLR94-K or approved equivalent.
8. Remote Site Monitor, Asentria SiteBoss550 model number S550-2/32M//T/-DC-ES-8C or approved equivalent configured for -48VDC input power and 2 expansion slots, one slot equipped with ES-8C 8 Dry Contact Closures card.
9. Telco Board, 48" x 48", ¾" AC grade plywood or better
10. First Aid Kit, Grainger model number 4EY88 or approved equivalent
11. Arrestor Trapeze Kit, Valmont model ATK306U or approved equivalent
12. Auxiliary Framework Tubing and Seismic Support per drawings.

E. A stoop/ramp shall be installed per the drawings. The stoop shall be concrete, 4' wide centered on the door. The ramp shall be no steeper than 1:12. The landing shall be 4' x 4' with the top of the landing no lower than 1" below the door's threshold.

2.3 SYSTEM CONFIGURATION

A. Place racks, cable trays, and ancillary equipment per drawings.

B. Coordinate conduit entry points in the floor with conduit placement.

C. All power will be fed by three-phase power from the main building and isolated with the isolation transformer listed in 27 53 19 Emergency Radio Communications System, which will then feed the Integrated Load Panel.

D. An internal Halo ground system shall be installed per drawings, with corner connections through the slab with ½" PVC schedule 80 sleeves at a 45-degree angle as well as connections from the lower Bus Bar to the BGR.

PART 3 EXECUTION

3.1 GENERAL

A. Installation Conditions and Requirements

1. Verbal statements by or opinions of Mono County relating to the existing system, site conditions, and installation conditions and requirements will not be considered binding.
2. The Contract Drawings indicate the general arrangement of circuits, conduit runs, equipment racks, antennas, transmission line runs, and other work. The information shown on the Contract Drawings is schematic; however, reconfiguration will not be permitted without specific acceptance.
3. Data presented on the Contract Drawings is as accurate as planning can determine, but accuracy is not guaranteed and field verification of all dimensions, locations, levels, etc., to suit field conditions is required.
4. The contractor shall review all Contract documentation, Reference Drawings, and Specifications and adjust all work to conform to all conditions shown therein.

3.2 WIRING AND WIRING PRACTICES

A. Wires and cables shall be installed according to the following:

1. All conductors shall be copper, of not less than 98 percent conductivity. Aluminum conductors are not permitted.

2. Conductors shall be continuous between terminals, without splices.
3. Conductor gauge, insulation, and shielding shall be adequate for the intended purpose.
4. Cable and wire shall be run neatly, with adequate lacing or clamping.
5. Consistent color coding shall be used throughout.
6. All applications requiring physical movement and flexing shall use stranded conductors.
7. Eye-type, crimped or soldered lugs shall be used with stranded wires terminated on screw-type terminals. Connections shall be made only with crimping tools that meet the connector manufacturer's specifications and have been adjusted in accordance with the crimping too manufacturer's requirements. All crimp connections shall be irreversible and shall imprint the manufacturer's listing mark.
8. Shielded wiring, or other means of signal isolation, shall be used wherever necessary to avoid cross-talk, hum, pops, clicks, and other forms of interference. The Contractor shall provide an interference-free system.
9. Unless installed in conduit, wiring within console cabinets, beneath raised floors, and from outlet boxes to free-standing or desk-mounted equipment shall be neatly installed, bundled with appropriate tie-wrap devices, and tied to supports if practicable.
10. Cable and wiring penetrations through metal cabinets shall be insulated with dielectric grommets. Any penetrations shall be made to maintain NEMA 4 ratings.
11. Extra wiring necessary for equipment movement shall be neatly coiled, tied, and concealed.
12. Any cable passages from one fire-rated area to another shall be packed with approved sealant to preserve fire-rating integrity.
13. Cables, wiring forms, and other interconnecting equipment shall be identified by permanent labels, tags, or other appropriate means.
14. Marking shall clearly indicate the function or source. Cables shall be identified at both ends with indications of the source and destination of that cable run. The cable identification shall agree with the wiring and interconnect diagrams.
15. All grounding shall meet TIA J-StO-607-A Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications and ANSI/ATIS 0600333-2013 – Grounding and Bonding of Telecommunications Equipment.

3.3 INSTALLATION OF EQUIPMENT

A. Installation of all interior items as described is to be made at the vendor's facility and arrive on site as one complete shelter.

B. The HVAC system shall be fully functioning and programmed for lead-lag function per the vendor's instructions.

C. All Rack Bus Bars shall be connected to the Primary Bus Bar (PBB) with a #2 listed copper conductor with a green jacket. The conductor shall connect to both bus bars with a 2-lug connection affixed with either an exothermic weld or irreversible compression crimp.

D. Halo ground shall be #2 copper, bare solid conductor including the down conductors. All connections to the Halo shall be made with either exothermic weld or irreversible compression crimp and oriented toward the PBB.

E. Grounding conductors shall have a minimum of an 8” radius and no more than a 90-degree bend.

F. All metallic objects on the wall shall be bonded to the Halo.

G. The cable tray shall be bonded to the PBB with a minimum #6 copper-stranded conductor with a green jacket.

H. Racks shall be bolted to the floor using seismic anchor bolts per manufacturer’s instructions, BLine model number ASSAM12156HN or approved equivalent.

I. Racks shall be laid out per Sheet R.EY-111, maintained 36” in front of any AC power devices per NEC, and 30” maintenance aisleways in other cases.

J. Lighting shall be positioned over the aisles.

K. The shelter shall be placed on and anchored to the foundation per the manufacturer’s instructions.

L. The smoke detector shall be powered and connected to the alarm monitoring system.

3.4 FINAL ACCEPTANCE

A. Final acceptance of the system shall consist of successful delivery and installation of the communication shelter ready for equipment installation per Section 27 53 19 and ready for grounding connections per Section 33 79 15.13., pass inspection by owner engineer, submittal by Contractor of all as-built drawings, test results, manuals, and other documentation, correction of all deficiencies, delivery of spare parts by the Contractor to Mono County, and final clean-up of installation sites.

END OF SECTION

ARCHITECTURE
ENGINEERING
PLANNING
INTERIORS
SUSTAINABILITY
GRAPHICS

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