TETER
ARCHITECTS ENGINEERS CONNECTED

PROJECT MANUAL

CONTRACTUAL – LEGAL REQUIREMENTS
TECHNICAL SPECIFICATIONS

FOR

MERCED CITY SCHOOL DISTRICT
Franklin Elementary School Modernization
(Phase 3)
(2) Modular P.C. Classroom Buildings, (2) Shade Structures, Play Equipment & Site Improvements / Utilities

Project No.: 23-12259
DSA File No.: 24-35
DSA Appl. No.: 02-122839

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IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 02-122839 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 03/07/2025

SECTION 000107
SEALS PAGE



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SECTION 011100
SUMMARY OF WORK

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 separate contracts.
4. Project schedule.
5. Owner furnished; contractor installed products.
6. Access to site.
7. Coordination with occupants.
8. Work restrictions.
9. Specification and drawing conventions.

B. Related Sections:

1. Division 01 Section "Multiple Contract Summary" for clarification of the work of multiple contracts on this project.
2. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification:

Merced City School District
Franklin Elementary School Modernization (Phase 3)
Site Improvements & Utilities for:
2 Modular Classroom Buildings
2 Shade Structures
1 Play Structure
2736 Franklin Road
Merced, CA

Architect's Project Number: **23-12259**

B. Owner:

Merced City School District
444 West 23rd Street
Merced, CA

Telephone: **(209) 385-6343**
Contact: **Bryan Behan**

C. Architect:

TETER, LLP
7535 North Palm Avenue, Suite 201
Fresno, California 93711

Telephone 559.437.0887
Contact: **Chris Nikkel**

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of the Project is defined by the Contract Documents and consists of the following:

1. (2) Modular classrooms building (By Global Modular) permanent stem wall foundation, pit set. Site work Contractor to provide Alternate Bid for foundation work, See Alternates.

2. (2) Shade Structures (By Park Planet), site work Contractor to provide Alternate Bid for foundation work, See Alternates.

3. (1) Play Structure (By Park Planet), site work Contractor to provide.

B. Type of Contract: Project will be constructed under multiple contracts.

1.5 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

B. For specific contract coordination requirements, see Division 01 Section “Multiple Contract Summary.”

C. Owner will award separate contracts for the following construction operations at Project site.

1. Modular Building Contract.
2. Site Work Contract.

1.6 PROJECT SCHEDULE

1.7 PROPOSED PROECT SCHEDULE

A.	TBD 16, 2025:	First Advertisement
B.	TBD 23, 2025:	Second Advertisement
C.	TBD 2, 2025 @ 10:00AM:	First Mandatory Pre-Bid Job Walk
D.	TBD 9, 2025 @ 10:00AM:	Second Mandatory Pre-Bid Job Walk
E.	**TBD 15, 2025 @ noon:**	**Last day for submission for RFI's**
F.	**TBD 16, 2025**	**Issuance of Final Addenda (if required)**
G.	**TBD 22, 2025 at 2:00 PM:**	**Bid Opening**
H.	**TBD 6, 2025**	**Anticipated Start of Contract Work** ***First Day of Limited Access for Specific Work Areas***
I.	**September 3, 2025** **relos & modular classrooms**	**Completion of Construction Phase A (Temp**
J.	**October 15, 2025**	**Completion existing relo modernization**
K.	**January 21, 2026**	**Completion (occupancy) of 9 Classrooms**

1.8 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 work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.9 COORDINATION WITH OCCUPANTS

A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's 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 authorities having jurisdiction.
2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

1.10 WORK RESTRICTIONS

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

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

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except as otherwise indicated.

1. Submit a written request to the Architect for work hours outside of the indicted on-site hours; request subject to review by the Owner.

C. 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 and Owner not less than 2 days in advance of proposed utility interruptions.
2. Obtain Architect’s and Owner’s written permission before proceeding with utility interruptions.

D. 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 and Owner not less than 2 days in advance of proposed disruptive operations.
2. Obtain Architect’s and Owner’s written permission before proceeding with disruptive operations.

E. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.11 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 with 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 scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes.

PART 2 - PRODUCTS (Not Used)

END OF SECTION

SECTION 011101
MULTIPLE CONTRACT 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 a summary of the Work of each contract including responsibilities for coordination and temporary facilities and controls. Contracts include the following:

1. Modular Building Contract.
2. Site Work Contract.

B. Specific requirements for Work of each contract are also indicated in individual Specification Sections and on Drawings.

C. Related Requirements:

1. Division 01 Section "Summary" for the Work covered by the Contract Documents, restrictions on use of Project site, coordination with occupants, and work restrictions.
2. Division 01 Section “Alternates” for description of alternate bids required and applicable to work of each contract.
3. Division 01 Section "Project Management and Coordination" for general coordination requirements.

1.3 COORDINATION

A. Coordinators: The Contractor for each contract shall appoint a project coordinator to be responsible for coordination of each contractor’s work with other contractors.

B. Coordination Activities: Coordination requirements shall include, but are not limited to, coordination of the following:

1. Work between contracts.
2. Access to shared or common work spaces.
3. Temporary facilities and controls.
4. Interruptions of permanent and temporary utilities, including those necessary to make connections for temporary services.
5. Construction and operations of the Work with work performed by each Contract.
6. Coordination drawings in collaboration with each contractor to coordinate work by more than one contract.

7. Quality-assurance and quality-control services specified in Division 01 Section "Quality Requirements" as applicable to respective Work.
8. Sequence of activities to accommodate tests and inspections, and coordinate schedule of tests and inspections as applicable to respective Work.
9. Information necessary to adjust, move, or relocate existing utility structures affected by construction.
10. Locate existing permanent benchmarks, control points, and similar reference points, and establish permanent benchmarks on Project site.
11. Provide progress cleaning of common areas and coordinate progress cleaning of areas or pieces of equipment where more than one contractor has worked.
12. Cutting and patching.
13. Protection of the Work.
14. Completion of interrelated punch list items.

1.4 GENERAL REQUIREMENTS OF CONTRACTS

A. Extent of Contract: Unless the Agreement contains a more specific description of the Work of each Contract, requirements indicated on Drawings and in Specification Sections determine which contract includes a specific element of Project.

1. Unless otherwise indicated, the work described in this Section for each contract shall be complete systems and assemblies, including products, components, accessories, and installation required by the Contract Documents.
2. Requirements Division 01 Specification Sections shall be applicable to each Contract for its own work.

B. Temporary Facilities and Controls: In addition to specific responsibilities for temporary facilities and controls indicated in this Section and in Division 01 Section "Temporary Facilities and Controls," contractor for each contract is responsible for the following:

1. Installation, operation, maintenance, and removal of each temporary facility necessary for its own normal construction activity, and costs and use charges associated with each facility, except as otherwise provided for in this Section.
2. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
3. Its own field office, complete with necessary furniture, utilities, and telephone service.
4. Its own storage and fabrication sheds.
5. Temporary enclosures for its own construction activities.
6. Staging and scaffolding for its own construction activities.
7. General hoisting facilities for its own construction activities.
8. Waste disposal facilities, including collection and legal disposal of its own hazardous, dangerous, unsanitary, or other harmful waste materials.
9. Progress cleaning of work areas affected by its operations on a daily basis.
10. Secure lockup of its own tools, materials, and equipment.
11. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.

1.5 MODULAR BUILDINGS CONTRACT

A. Work of the Modular Buildings Contract includes, but is not limited to, the following:

1. Modular building as specified in Division 13 Section “Prefabricated Modular
2. Structures.”
3. Structural design and preparation of delegated design submittal/construction documents through California Division of the State Architect Approval.
4. Title 24 Lighting Compliance based upon selected light fixtures and controls.
5. Concrete foundations for modular buildings including building footings, formwork, reinforcing steel and concrete, subject to Alternate Bids requirements.
6. Under-building utilities (extend 5 feet beyond the building)
7. Off-site and on-site construction of modular building.

1.6 SITE WORK CONTRACT

A. Work of the Site Work Contract includes, but is not limited to, the following:

1. Remaining work not identified as work under other contracts.
2. Selective demolition of selected site improvements as indicated on Drawings and as necessary to accommodate the Work.
3. Site preparation: site clearing, earthwork including over excavation and backfill for construction of building pads for modular buildings and rubberized surface.
4. Pad prep, footing excavation and haul off to be scope of site work contract.
5. Concrete foundations for modular buildings including building footings, footing excavation, formwork, reinforcing steel, termiticide and concrete, subject to Alternate Bids requirements.
6. Under-building utilities (extend 5 feet beyond the building) subject to Alternate Bids requirements.
7. Site improvements, including fencing, parking lots and pedestrian paving.
8. Site utilities, trenching, backfill, and patching.

B. Temporary facilities and controls of the Site Work Contract include, but are not limited to, the following:

1. Temporary facilities and controls that are not otherwise specifically assigned to other contracts.
2. Sediment and erosion control.
3. Unpiped temporary toilet fixtures, wash facilities, and drinking water facilities, including disposable supplies.
4. Project identification and temporary signs.
5. General waste disposal facilities.
6. Temporary fire-protection facilities.
7. Barricades, warning signs, and lights.
8. Site enclosure fence.
9. Security enclosure and lockup.
10. Environmental protection.
11. Restoration of Owner's existing facilities used as temporary facilities.

C. Plumbing Work of the Site Work Contract includes, but is not limited to, the following:

1. Site water distribution, sewers, and storm drainage as indicated on the drawings.
2. Site water distribution shall be extended and connected to points of connection for modular buildings.
3. Under-building utilities (extend 5 feet beyond the building), subject to Alternate Bids requirements.

D. Electrical Work of the Site Work Contract includes, but is not limited to, the following:

1. Site electrical distribution.
2. Site communications and security.
3. Electrical service and distribution.
4. Under-building utilities (extend 5 feet beyond the building), subject to Alternate Bids requirements.

1.7 CONTRACT COMPARISON

A. Work outside of the modular buildings shall be the responsibility of the Site Work Contractor; Work interfacing with and relating to the modular building and Site Contractor work shall be the responsibility of the Contracts as indicated on the drawings and as follows:

	Spec Section / Work Item	**Modular Buildings**	**Site Contractor**			**Comments**
1.	Division 01 Sections	X	X			As applicable to the work of each contract for its own work.
2.	014000 Quality and Testing Requirements: General	X	X			As applicable to the work of each contract for its own work.
3.	014000 Quality and Testing Requirements: Concrete testing for slabs & footings	X	X			As applicable to the work of each contract for its own work.
4.	015000 Temporary Facilities and Controls	X	X			See Division 01 Section Temporary Facilities and Controls, Responsibility Matrix.
5.	024109 Selective Demolition		X			As indicated on Drawings.
6.	033000 Cast-in-Place Concrete: Modular foundations	X	X			Base Bid: By Modular Building Contractor Bid Alternate: by Site Contractor
7.	093000 Tiling: Exterior porcelain tile	X	X			Base Bid: Modular Building Contractor Bid Alternate: FRP
8.	101400 Signage: Signs for room or space identification		X			As indicated on Drawings
9.	23000 Plumbing: Under building utilities (within 6 inches of building perimeter)	X	X			Base Bid: Modular Building Contractor Bid Alternate: Site Contractor

	Spec Section / Work Item	Modular Buildings	Site Contractor			Comments
10.	Division 26 Electrical: Power distribution to and connection of power modular building.		X			As indicated on Drawings.
11.	Division 27 Communications: Building security and IT devices and systems within modular building	X	X			Rough-in (conduit and boxes) by Modular Building Manufacturer. Wiring, devices, and fixtures by Site Contractor
12.	Division 28 Fire Alarm: Fire alarm system within modular building	X	X			Rough-in (conduit and boxes) by Modular Building Manufacturer. Wiring, devices, and fixtures by Site Contractor
13.	311100 Site Clearing: Site Clearing		X			
14.	312000 Earthwork: Over excavation, fill, and compaction, finish grading of soil in vicinity of building and termiticide treatment. in the area of modular buildings.		X			
15.	312000 Earthwork: Excavation limited to modular building footings, removal of excess soil.		X			
16.	321313 Concrete Paving and Walks: Concrete paving, walks and under building concrete slurry		X			

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 011103
ADDENDA

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 requirements for Addenda issued prior to bid opening.

B. Related Requirements:

1. Division 00 Sections as applicable to contract requirements and modifications.
2. Division 01 Section "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
3. Division 01 Section "Contract Modification Procedures" for changes to the Contract Documents after award of the Contract.

1.3 NOTICE TO BIDDERS

A. Addenda will be issued to registered plan holders for changes to the drawings and specifications during the bidding period prior to the bid opening. Addenda shall serve to clarify, revise, and supersede information in the Project Manual, Drawings, and previously issued Addenda. Portions of the Addenda affecting the Contract Documents will be incorporated into the Contract by enumeration of the Addendum in the Owner/Contractor Agreement.

B. The Bidder shall acknowledge receipt of this Addendum in the appropriate space on the Bid Form.

1.4 GOVERNING AGENCY REVIEW AND APPROVAL

A. Addenda shall be submitted to The Division of the State Architect (DSA) by the project Architect and shall be approved by the DSA in order to be officially incorporated into the construction documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 011105
USE OF ARCHITECT'S ELECTRONIC FILES

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 use of Architect's electronic Contract Document drawing files.

B. Related Sections:

1. Division 01 Section "Project Management and Coordination."
2. Division 01 Section "Submittal Procedures."
3. Division 01 Section "Project Record Drawings."

1.3 USE OF ARCHITECT'S ELECTRONIC FILES

A. Architect may make available to Contractor digital data files of Architect's Drawings for use in preparing shop drawings, coordination drawings, and project record drawings.

1. Electronic files will be available without charge.
2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
3. Files will be supplied digitally via email or FTP site and will be in PDF, DWG, or similar common format.
4. Waiver of Liability: Contractor, Subcontractors, and Suppliers of this Project shall each execute a waiver of liability for each use of the Architects electronic files.
    a. Waiver of Liability form shall be submitted to the Architect at the time or request for use of Architect's electronic data files.
    b. Waiver of Liability form shall be the "ELECTRONIC DATA FILE DISTRIBUTION WAIVER OF LIABILITY FORM" included at the end of this Specification Section.
    c. The use of the electronic files shall only be used for this Project and for the identified purposes noted in the Waiver of Liability form.
        1) Each entity shall be responsible for complying with the restrictions of the Liability Waiver form.
        2) Electronic Contract Document drawing files received from the architect shall not be duplicated without written permission of the Architect.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

(Electronic Data File Distribution Waiver of Liability included on the following page)

TETER, LLP
ARCHITECTS ENGINEERS CONNECTED

ELECTRONIC DATA FILE DISTRIBUTION WAIVER OF LIABILITY

TETER, INC
7535 North Palm, Suite 201
Fresno, California 93711

Project: _____

Intended Use: _____

Any electronic data, files or information provided under this Agreement are the property of the above listed Professionals and consultants (Team). It is understood and agreed that the information contained in these electronic data file shall not be copied or duplicated for any use other than the project for which they were created. It is understood by the undersigned that compatibility of this electronic media with other systems is not guaranteed, and conversion to other systems is done at the user's own risk.

The user hereby agrees and recognizes that designs, plans and data stored on electronic media including, but not limited to, computer disk and magnetic tape, may be subject to undetectable alteration and/or uncontrollable deterioration. It is agreed by the undersigned that the Team shall not be liable for the completeness or accuracy of any material provided on electronic media.

The undersigned agrees to defend, hold harmless and indemnify the Team and its officers, directors, employees, agents and consultants for any and all claims, losses, costs or damage whatsoever arising out of, resulting from, or in any way related to the use of electronic data files provided hereunder, whether that use is authorized or unauthorized. The user further agrees to defend, indemnify and hold harmless the Team its officers, directors, employees, agents and consultants from any and all claims, damages, losses, expenses and injuries arising out of the modification of the electronic data files by the user or by anyone obtaining said files through or from the user.

The Team bears no responsibility for the information in the electronic data files once it leaves the offices of **TETER**, LLP. The undersigned understands that the electronic data files are subject to applicable copyright laws of the United States and agrees to be bound by same. Upon our receipt of this agreement duly executed by an Officer of your firm you may request the Data files.

Name (Print/Sign): _____ Date: _____

Firm: _____ _____

Phone and email: _____ _____

Name (Print/Sign): _____ Date: _____

Firm: _____ _____

Phone and email: _____ _____

Name (Print/Sign): _____ Date: _____

Firm: _____ _____

Phone and email: _____ _____

SECTION 012300
ALTERNATES

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 alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule of Alternates: A schedule of alternates is included in Part 3 Article “Schedule of Alternates” at the end of this Section.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Classroom Modular Building Foundations and Under Building Utilities.

1. Base Bid: Site Contractor provides the foundation excavations, concrete footings, foundation embed items, under building utility systems including trenching and backfill, ground termite treatment, final backfill and grading to 5 ft. outside building.

2. Bid Alternate: All work listed above in Base Bid shall be deducted from the Site Work Contract and added to the Modular Building Contract. Site Work Contractor shall closely coordinate with the Modular Building Contractor to accurately locate all foundation embed items and under building utility work as required by the approved modular building drawings. Modular Manufacturer shall fabricate and furnish the foundation embed items to Site Work Contractor for installation.

B. Alternate No. 2: Interior Improvements of existing relocatable buildings (P29, P30, P35, P36, P37, & P38)

1. Base Bid: Provide the interior finish improvements as described in the construction documents.

2. Bid Alternate: All work listed above in alternate no. 2 Base Bid shall be deducted from the Site Work Contract.

C. Alternate No. 3: 16’x35’ PC. Approved Entrance Canopy.

1. Base Bid: Provides (1) 16’x35’ shade structure improvement as described in the construction documents.

2. Bid Alternate: All work listed above in alternate no. 3 Base Bid shall be deducted from the Site Work Contract.

D. Alternate No. 4: Flagpole.

1. Base Bid: Site Contractor provides Flagpole improvements as described in the construction documents.

2. Bid Alternate: All work listed above in alternate no. 4 Base Bid shall be deducted from the Site Work Contract.

E. Alternate No. 5: Marque Sign

1. Base Bid: Site Contractor provides Marque Sign improvements as described in the construction documents.

2. Bid Alternate: All work listed above in Base Bid shall be deducted from the Site Work Contract.

END OF SECTION

SECTION 012500
SUBSTITUTION 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 administrative and procedural requirements for substitutions.

B. Related Sections:

1. Division 00 Section “Instructions to Bidders” and other Division 00 Sections as applicable to substitution requests prior to submission of bids.
2. Division 01 Section “DSA Hourly Fee Services” for DSA hourly fee services for review of changes to DSA approved Construction Documents.
3. Division 01 Section “Contract Modification Procedures” for changes to DSA approved Construction Documents.”
4. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
5. Divisions 02 through 33 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor that are not required in order to meet other Project requirements but may offer advantage to the Owner.

1.4 REGULATORY REQUIREMENTS

A. Division of the State Architect (DSA) Review and Approval: Substitutions resulting in changes to DSA approved Construction Documents may be considered a change requiring DSA review and approval and submission of a DSA Construction Change Document (CCD) form by the Architect.

1. DSA Construction Change Documents shall be as specified in Division 01 Section “Contract Modification Procedures.”
2. DSA Hourly Fee Services for review of CCD’s shall be as specified in Division 01 Section “DSA Hourly Fee Services.”

1.5 SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title, and Drawing numbers and titles.

1. Substitution Request Form: Use form provided at the end of this Section.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

    a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    e. Samples, where applicable or requested.
    f. Certificates and qualification data, where applicable or requested.
    g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
    h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
    j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later. Architect will not act on any Post-Bid Substitutions until 7 days following the submission of the Schedule of Values per Division 01 Section “Payment Procedures.”

a. Forms of Acceptance:

1) Substitutions Prior to Bid: Addenda will be issued for substitutions accepted prior to bid.
2) Substitutions After Award of Contract: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.6 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1.7 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions Prior to Bid: Architect will consider requests for substitution if received within 21 days prior to the submission of bids. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider bidder’s request for substitution when the following conditions are satisfied.

a. Substitutions prior to bid shall also be subject to the requirements of applicable Division 00 Specification Sections.
b. Substitutions prior to bid shall comply with the requirements for Substitutions for Cause or Substitutions for Convenience as applicable.

2. Substitutions requested by bidders during the bidding period, and accepted by Addendum prior to award of the Contract, are considered as included in the Contract Documents.

B. Substitutions After Award of Contract: The Contractor after award of the Contract, as allowed by the General Conditions, may submit materials and methods to be considered for substitutions.

1. The following are not considered to be substitutions:

a. Revisions to the Contract Documents requested by the Owner or Architect.
b. Specified options of products and construction methods included in the Contract Documents.
c. The Contractor’s compliance with governing regulations and orders issued by governing authorities.

C. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 21 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.

f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

D. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION

(Substitution Request Form included on the following page)

TETER, LLP
ARCHITECTS ENGINEERS CONNECTED

SUBSTITUTION REQUEST FORM

FOR: 23-12259 Franklin Phase 3 Modernization

We hereby submit for your consideration the following product instead of the specified item for the above project:

SECTION	PARAGRAPH	SPECIFIED ITEM
_____	_____	_____

Proposed Substitution: _____

Attach complete technical data, including laboratory tests, if applicable.

Include complete information on changes to Drawings and/or Specifications which proposed substitution will require for its proposed installation.

Fill in the blanks below:

A. Does the substitution affect dimension on Drawings:

_____

B. Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitution?

_____

C. What affect does substitution have on other trades?

_____

D. Difference between proposed substitution and specified item?

_____

E. Manufacturer's guarantees of the proposed and specified items are:

_____ Same _____ Different (explain on attachment)

F. Cost difference between proposed substitution and specified item - savings to Owner?

_____

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item and will be at no additional cost to the Owner.

Submitted to the Architect by:

Signature: _____

Firm: _____

Address: _____

_____

Date: _____

Telephone: _____

For Use by Design Consultant

Accepted _____
Accepted as Noted _____
Not Accepted _____
Received Too Late _____

By: _____

Date: _____

Remarks: _____

SECTION 012600
CONTRACT MODIFICATION 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 administrative and procedural requirements for handling and processing Contract modifications including the following:

1. Governing Agency approval.
2. Bulletins.
3. Architect's Supplemental Instructions.
4. Architect's Change Directive.
5. Requests for Proposals.
6. Change Order Requests.
7. Cost Change Directives.
8. Change Orders.

B. Related Requirements:

1. Division 00 Sections as applicable to contract requirements and modifications.
2. Division 01 Section "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
3. Division 01 Section "DSA Hourly Fee Services" for fees charged by DSA for changes to the Construction Documents.

1.3 DEFINITIONS

A. Contract Modification: A change to the Contract Agreement between the Owner and the Contractor affecting the Contract Documents, the Contract Time, and/or the Contract Amount.

1.4 GOVERNING AGENCY APPROVAL

A. DSA Approval: Changes to DSA approved Construction Documents shall be reviewed and approved by DSA.

1. Changes to DSA Approved Construction Documents shall comply with requirements of DSA Interpretive Regulation IR A-6, “Construction Change Document Submittal and Approval Process” and shall be accompanied by DSA Form 140 “Application for Submittal of Post-Approval Document.”
2. Architect shall be responsible for preparing Construction Change Documents and submitting documentation to DSA.

B. DSA Hourly Fee Services: Changes to DSA approved Construction Documents shall be reviewed by DSA and shall be subject to DSA Hourly Fee Services. Charges will be made to the Owner by DSA.

1. Where changes to DSA approved Construction Documents are the result of actions by the Contractor, the Contractor shall be liable for DSA Hourly Fee Services as described in Division 01 Section “DSA Hourly Fee Services.”

1.5 BULLETINS

A. Bulletins: A form used by the Architect for issuing Architect’s Supplemental Instructions (ASI), Architect’s Change Directives (ACD), and Requests for Proposals (RFP).

1.6 ARCHITECT’S SUPPLEMENTAL INSTRUCTION

A. Architect’s Supplemental Instruction (ASI): Supplemental instructions will be issued by the Architect authorizing minor changes in the Work not involving adjustment to the Contract Sum or the Contract Time.

1. Architect’s Supplemental Instructions will be issued via Bulletin and signed by the Architect.
2. Contractor’s Response: Contractor shall perform the work indicated in the Architect’s Supplemental Instruction without adjustment to the Contract Sum or the Contract Time. If the Contractor determines that an adjustment to the Contract Sum or the Contract Time is necessary due to the Architect’s Supplemental Instruction, the Contractor shall respond to the Architect’s Supplemental Instruction as if it were an Architect/Owner initiated Request for Proposal.

B. DSA Review and Approval: Architect’s Supplemental Instructions affecting changes to the DSA Approved Construction Documents shall be subject to DSA review and approval; Architect shall submit applicable DSA CCD documentation to DSA for approval.

1.7 ARCHITECT'S CHANGE DIRECTIVE

A. Architect's Change Directive (ACD): Architect's Change Directives will be issued by the Architect instructing the Contractor to proceed with a change in the Work for subsequent inclusion in a Change Order.

1. Architect's Change Directives will be issued via Bulletin and signed by the Architect.
2. Architect's Change Directives contain a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation by Contractor: Maintain detailed records on a time and material basis of work required by the Architect's Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

C. DSA Review and Approval: Architect's Change Directives affecting changes to the DSA Approved Construction Documents shall be subject to DSA review and approval; Architect shall submit applicable DSA CCD documentation to DSA for approval.

1.8 REQUEST FOR PROPOSALS

A. Requests for Proposals: Requests for Proposals are Architect/Owner initiated requests for estimates of changes to the Contract Sum and/or Contract Time for proposed changes; Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. The description may include supplemental or revised Drawings and Specifications.

1. Requests for Proposals will be issued by the Architect via Bulletin.
2. Requests for Proposals are not authorization or instructions to either stop work in progress or execute proposed change(s).
3. Contractor's Response: Within not more than 7 days after receipt of Request for Proposal, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    e. Quotation Form: Use forms acceptable to Architect.

B. Architect's Response: Within 7 days after receipt of Contractor's response to Architect/Owner initiated Request for Proposal, Architect will:

1. Issue a Change Order or Cost Change Directive for accepted proposals.
2. Notify the Contractor of unaccepted proposals.
3. Issue an Architect's Change Directive where changes are necessary for the progress of the Work and changes to the Contract Sum and the Contract Time are in dispute.

1.9 CHANGE ORDER REQUEST

A. Change Order Request (COR): Change Order Requests are documents initiated by the Contractor requesting a Contract Modification due to unforeseen conditions, or latent or changed conditions.

1. Change Order Request Form: Use form acceptable to Architect.
2. Include a statement outlining reasons for the Change Order Request and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
3. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
4. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
5. Include costs of labor and supervision directly attributable to the change.
6. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
7. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

B. Architect's Response: Within 7 days after receipt of Contractor's Change Order Request, Architect will:

1. Issue a Cost Change Directive for accepted Change Order Requests that do not require changes to the approved Construction Documents.
2. Issue a Change Order and/or Cost Change Directive for accepted Change Order Requests that require changes to the approved Construction Documents.

    a. Where Change Order Requests require changes to the Contract Documents, Architect will provide a detailed description of proposed changes in the Work via Change Order.

3. Issue an Architect's Change Directive where changes are necessary for the progress of the Work and changes to the Contract Sum and the Contract Time are in dispute.
4. Notify the Contractor of unaccepted proposals.

1.10 COST CHANGE DIRECTIVE (CCD)

A. Cost Change Directive: A Cost Change Directive is a document issued by the Architect notifying Contractor of Owner’s acceptance of changes to the Contract Sum proposed by the Contractor.

1.11 CHANGE ORDERS

A. Change Orders: Change orders are a document defining Contract Modifications; upon Owner's approval of proposed Contract Modifications, Architect will issue a Change Order for signatures of Owner and Contractor on form provided by Architect.

B. DSA Review and Approval: Change Orders affecting changes to the DSA Approved Construction Documents shall be subject to DSA review and approval; Architect shall submit applicable DSA CCD documentation to DSA for approval.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 012605
DSA HOURLY FEE SERVICES

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.

B. Division of the State Architect (DSA) Interpretation of Regulations IR A-30 "DSA Hourly Fee Services" latest edition (Document is available on DSA's website under "Publications;" Interpretation of Regulations (IRs); A- Administrative; IR A-30).

https://www.dgs.ca.gov/dsa/

1.2 SUMMARY

A. Section includes administrative and procedural requirements for DSA Hourly Fee Services associated with changes to DSA approved Construction Documents.

B. Related Requirements:

1. Division 00 Sections as applicable to contract requirements and modifications.
2. Division 01 Section "Addenda."
3. Division 01 Section "Substitution Procedures."
4. Division 01 Section "Contract Modification Procedures."
5. Division 01 Section "Payment Procedures."
6. Division 01 Section "Submittal Procedures."
7. Division 01 Section "Product Requirements."

1.3 DSA HOURLY FEE SERVICES

A. General: Changes to DSA approved Construction Documents shall be documented by the use of DSA Construction Change Document (CCD) forms. CCD forms shall be submitted to DSA by the Architect.

1. Refer to Division 01 Section "Contract Modification Procedures" for additional information regarding DSA CCD's.

B. DSA Hourly Fee Services: Changes to DSA approved Construction Documents shall be reviewed by DSA and shall be subject to DSA Hourly Fee Services for review at a rate established by DSA IR A-30. Charges will be made to the Owner by DSA.

1. Hourly Rate: Rate per hour as established by DSA IR A-30, latest edition.

C. Bidder's Responsibility: Prior to bidding, where a bidder's request for substitution or similar action results in a change requiring DSA Hourly Fee Services, bidder shall submit a deposit to the Architect for reimbursement for DSA Hourly Fee Services. The deposit amount shall be established by the Architect, a minimum of one hour of DSA Hourly Fee Services (hourly rate as established by DSA IR A-30) will not be refundable. Deposits shall be made payable to the Owner.

D. Contractor's Responsibility: When a contractor's action results in a change requiring DSA Hourly Fee Services, charges by DSA to the Owner will be deducted from the Contract Sum and the Architect will issue a Change Order on a quarterly basis to adjust the Contract Sum.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 012613
REQUEST FOR INFORMATION

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 provisions for preparation, submittal and response to Contractor’s Request for Information (RFI’s) during construction of project.

1.3 DEFINITIONS

A. RFI, Request for Information: Request from Contractor seeking information required by or clarification of the Contract Documents.

1.4 SUBMITTALS

A. RFI Submittals: Submit RFI’s via email as PDF electronic files; include attachments in PDF electronic file format.

1.5 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Form: Use RFI form included at end of this Section or form acceptable to Architect. Upon request from the Contractor, the form at the end of this section will be made available in WORD format from the Architect.

D. Architect's Action: Architect will review each RFI, determine action required, and respond.

1. Allow 10 working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
2. Architect will not act on any RFI’s until 7 days following the submission of the Schedule of Values per Division 01 Section “Payment Procedures.”
3. The following RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor’s means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

4. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
5. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

6. Distribution: The Architect shall distribute one electronic copy of each completed RFI review to the Contractor and the Owner.

E. Regulatory Requirements: Architect's responses that modify the Contract Documents affecting Structural Safety, Fire and Life Safety, and/or Access Compliance shall be submitted to the Division of the State Architect for review and approval.

1. Changes to DSA approved Construction Documents shall be as specified in Division 01 Section "Contract Modification Procedures."

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the sequential RFI number. Submit log weekly unless otherwise directed in writing by Architect. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

G. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within 7 days if Contractor disagrees with response.

H. Contractor's Expense for RFI's: Architect will review and respond to legitimate RFI's at no additional cost to the Contractor. RFI's determined by the Architect to be flagrant or unnecessary will have the expense for the Architect's time paid by the Owner with the amount being deducted from the Contract Sum. The expense will be based on an hourly rate in accordance with the Architect's standard hourly rate schedule in effect at the time the work is performed with a minimum of one hour for each flagrant or unnecessary RFI.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

(REQUEST FOR INFORMATION form included on the following page)

TETER
ARCHITECTS ENGINEERS CONNECTED

REQUEST FOR INFORMATION

Project:
23-12259
Classrooms & Site
Franklin Elementary School

From:

Client Project No.

DSA File No.

DSA Appl No.

Date:

Request for Information No. _____

☐ Deviation from Contract Docs

☐ Correction of Non-Compliant Work

To:
TETER
7535 N. Palm Avenue, Ste. 201
Fresno, CA 93711

Drawing:_____

Detail No._____

Specification:_____

Addendum:_____

Respond by:

Priority
(Low) 1 2 3 4 5 (High)

Subject: _____

Information Requested:

Contractor's Recommendation:

Probable Cost Effect: _____ Probable Time Effect: _____

Architect's Response:

Disclaimer
The work shall be carried out in accordance with the above supplemental instructions pursuant the Contract Documents, without change in the Contract Sum or Contract Time. Proceeding with the Work, according to these instructions, indicates your acknowledgement that there will be no change in the Contract Sum or Contract Time. If the Contractor considers that this response requires a change in the Contract Sum or Contract Time, the Contractor shall not proceed with this Work and shall promptly submit an item proposal.

SECTION 012900
PAYMENT 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 specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections:

1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
3. Division 01 Section "Submittal Procedures" for administrative requirements governing the preparation and submittal of the submittal schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

a. Application for Payment forms with continuation sheets.
b. Submittal schedule.
c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the Schedule of Values to Architect at earliest possible date but no later than 7 days before the date scheduled for submittal of initial Applications for Payment.

    a. Architect will not act on any RFI's, Post-Bid Substitutions, and/or changes to the project scope, cost, or schedule until 7 days following the submission of the Schedule of Values.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

    a. Project name and location.
    b. Name of Architect.
    c. Architect's project number.
    d. Contractor's name and address.
    e. Date of submittal.

2. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

        1) Labor.
        2) Materials.
        3) Equipment.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of 5 percent of Contract Sum.

    a. Include separate line items under Contractor and principal subcontracts for project closeout requirements in an amount totaling 5 percent of the Contract Sum and subcontract amount.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

8. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

    1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment application shall be as indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

    1. If dates and periods are not indicated in the Agreement between Owner and Contractor at time of bidding, the date for Application for Payment shall be established by the Owner to correspond with the Owner’s administrative procedures in order to allow for processing and approval of Application for Payment. The period of construction work covered by each Application for Payment shall be one month.
    2. Submit draft copy of Application for Payment 7 days prior to due date for review by Architect.

C. Application for Payment Forms: Use forms acceptable to Architect and Owner for Applications for Payment. Submit forms for approval with initial submittal of schedule of values.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Materials previously stored and included in previous Applications for Payment.
    b. Work completed for this Application utilizing previously stored materials.
    c. Additional materials stored with this Application.
    d. Total materials remaining stored, including materials with this Application.

F. Transmittal: Submit 6 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Submittal schedule (preliminary if not final).
5. List of Contractor's staff assignments.
6. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
7. Initial progress report.
8. Report of preconstruction conference.

I. Application for Payment at Substantial Completion: After issuance of the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portions of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Updated final statement, accounting for final changes to the Contract Sum.
3. Evidence that claims have been settled.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013113
PROJECT MANAGEMENT AND 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. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Administrative and supervisory personnel.
3. Coordination drawings.

B. Related Sections:

1. Division 01 Section "Project Meetings" for project meetings.
2. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
3. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
4. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.
5. Section 019113 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.3 SUBMITTALS

A. List of Key Personnel Names: Within 15 calendar days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

B. Coordination Drawings:

1. Initial Submittal: Submit digital PDF document of each coordination drawing for each condition where Coordination Drawings are required.
2. Project Closeout:

    a. Submit 3 printed “Record” copies of each coordination drawing for each condition where Coordination Drawings are required.
    b. Submit “Record” electronic coordination drawing files.

1.4 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to 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. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity. Coordination Drawings shall include the work of multiple trades on the same drawing. Where applicable, provide coordination drawings for the following:

1. Utility connections for building services.
2. Utility connections for equipment.
3. The crossing of multiple underground utilities.
4. Equipment installations and required service space with adjacent construction.
5. Work above ceilings including but not limited to lighting fixtures, ductwork, fire sprinkler piping, mechanical equipment, and building structure.

B. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
1. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
2. Coordinate the addition of trade-specific information to the coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
3. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
4. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
5. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
6. Indicate required installation sequences.
7. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
8. Mechanical and Plumbing Work: Show the following:

a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.

b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
c. Fire-rated enclosures around ductwork.

9. Electrical Work: Show the following:

a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
d. Location of pull boxes and junction boxes, dimensioned from column center lines.

10. Fire-Protection System: Show the following:

a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

C. Coordination Drawings: Where Project conditions necessitate coordination drawings, provide coordination drawings as follows:

1. Overhead Work and Work Above Finished Ceilings: Indicate framing for support of ceiling and wall systems, conduit and piping runs, plumbing, mechanical, and electrical equipment, and related Work. Locate components to accommodate layout of light fixtures indicated on Drawings. Show the work of each trade including, but not limited to, pipe runs, mechanical ductwork, cable trays, conduit runs, and bracing and supports.

a. Indicate locations of all dampers, valves, cleanouts and other devices requiring human access for maintenance and repair. Where access panels are required, show locations and indicate size.
b. Show the height above finish floor each item, demonstrating sufficient space for installation and maintenance. Indicate sizes of ducts, piping and similar items.
c. Layout of work shall be done in such a manner to avoid conflicts between the work of different trades, finish ceiling heights, soffits, light fixtures or other finish work at ceilings and soffits.
d. Should unavoidable conflicts occur that affect finish ceiling and soffit heights, methods of installations, methods of construction or means of accessibility, the contractor shall clearly identify each location for review by the Architect.

2. Equipment Rooms and Outdoor Service Yards: Show work above and below grade including mechanical, plumbing, fire protection, fire alarm, and electrical equipment, and related supports, accessories, and utility connections. Include the following information:

a. Equipment: Show equipment and locations, utility connections, and working and service clearances.

b. Utilities: Show above and below grade utilities; indicate heights and below grade elevations, sizes of piping and conduit, dimensions between utilities and between utilities and other obstructions including concrete footings for other work. Show locations of all shut-off and isolation valves, cleanouts, filters, and other devices requiring human access for maintenance and repair.
c. Enclosures: Show limits of enclosure including walls, doors, fences, and gates; confirm door and gate access width for equipment.
d. Dimensions: Indicate dimensions as appropriate to insure adequate clearance will be provided for installation, service, and operation of equipment; include horizontal and vertical dimensions between utilities to insure clearance for installation of utilities. Include vertical dimension(s) of equipment and distances to overhead obstructions where applicable.

3. Roof Mounted Equipment: Show equipment that will be located on the roof, include the following:

a. Equipment locations and horizontal distances between equipment.
b. Locations of roof penetrations, sizes of penetrations, and indicate the horizontal distance between penetrations and roof mounted equipment.
c. Pipe and conduit runs including locations and type(s) of supports.
d. Distance between all roof mounted equipment and roof drainage features. Equipment shall be located so as to not obstruct roof drainage; provide at least 24 inches between equipment platforms and valleys formed by the intersection of roof planes and crickets.

4. Underground Site Utilities and Utilities Below Slabs on Grade within Building Areas: Where underground utilities cross other utilities, penetrate footings, underground structures or other obstructions; show the work that will be placed underground; include the following information:

a. Indicate types and sizes of utility piping and elevations below grade.
b. Show footings and other underground structures; where unavoidable conflicts occur between underground structures/footings and utilities, indicate depths below grade and clearly identify locations for sleeving for review by Architect.

5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.

D. Coordination Drawing Digital Data Files: Prepare coordination digital data files according to the following requirements:

E. Coordination Drawing Digital Data Files: Submit digital coordination drawing files using PDF format.

1. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.

a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
b. Digital Data Software Program: Drawings are available in PDF format.
c. Contractor shall execute a data licensing agreement as required by Division 01 Section “Use of Architect’s Electronic files.

F. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.

G. Resolution of conflicts occurring in the Work after Coordination Drawings have been prepared shall be the responsibility of the Contractor. Contractor shall bear all costs associated with resolution of conflicts including additional contract time, architectural and engineering services fees, and loss of use to the Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013119
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 SUMMARY

A. Section includes administrative provisions for project meetings, including, but not limited to, the following:

1. Preconstruction conferences.
2. Preinstallation conferences.
3. Progress meetings.
4. Project Closeout Conference.

B. Related requirements include but are not limited to the following:

1. Division 01 Sections as applicable to project management.

1.3 PRECONSTRUCTION CONFERENCE

A. Preconstruction Conference: Schedule a preconstruction conference before starting construction at the project site, at a time convenient to the Owner, Inspector of Record, and the Architect, but no later than 14 days after execution of the Agreement. Hold the conference at the Project Site or another convenient location. Owner and Architect to conduct the meeting to review responsibilities and personnel assignments.

B. Attendees: Authorized representatives of the Owner, Architect, and their consultants; the Contractor and its superintendent shall attend the conference. Major subcontractors and other concerned parties shall be invited to attend the conference, but attendance is not mandatory. Participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress, including but not limited to the following:

1. Tentative construction schedule.
2. Critical work sequencing and long-lead items.
3. Designation of key personnel and their duties.
4. Lines of communication.
5. Procedures for processing field decisions and Change Orders.
6. Procedures for processing Applications for Payment.

7. Procedures for RFI's.
8. Procedures for testing and inspection.
9. Submittal procedures.
10. Sustainability requirements including construction waste management and disposal.
11. Preparation of record documents.
12. Use of the premises.
13. Work restrictions and working hours.
14. Temporary facilities and controls.
15. Parking availability.
16. Office, work, and storage areas.
17. Equipment deliveries and priorities.
18. Safety procedures and first aid.
19. Security.
20. Housekeeping.
21. Owner's alcohol, drug and tobacco policy.

D. Minutes: Contractor shall record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Inspector of Record, and Architect, within three days of the meeting.

1.4 PREINSTALLATION CONFERENCES

A. Preinstallation Conferences: Conduct a preinstallation conference at the Project Site before each construction activity that requires coordination with other construction.

B. Attendees: Installers and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Owner, Inspector of Record, and Architect of scheduled meeting dates.

C. Agenda: Review the progress of other construction activities and preparations for the particular activity under consideration at each preinstallation conference, including requirements for the following:

1. Contract Documents.
2. Options.
3. Related RFI's, Proposal Requests, and Change Orders.
4. Purchases.
5. Deliveries.
6. Submittals.
7. Sustainability requirements.
8. Possible conflicts.
9. Compatibility problems.
10. Time schedules.
11. Weather limitations.
12. Manufacturer's written instructions.
13. Warranty requirements.
14. Compatibility of materials.
15. Acceptability of substrates.

16. Temporary facilities.
17. Space and access limitations.
18. Regulations of authorities having jurisdiction.
19. Safety.
20. Testing and ionspecting requirements.
21. Required performance results.
22. Recording requirements.
23. Protection.
24. Record significant conference discussions, agreements, disagreements, including corrective measures and actions.
25. Promptly distribute minutes of the meeting to each party present and to other parties requiring information, including the Owner and the Architect.
26. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

D. Minutes: Contractor shall record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Inspector of Record, and Architect, within three days of the meeting.

1.5 PROGRESS MEETINGS

A. Progress Meetings: Conduct progress meetings at the Project Site at regular intervals to be established by the Architect, Inspector of Record, Contractor, and Owner.

1. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: In addition to representatives of the Owner and Architect, each subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. 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 status of the Project. Review proposed percentages of work completed for current months progress payment.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. 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 the following:

    a. Interface requirements.
    b. Sequence of operation.
    c. Status of submittals.
    d. Status of Sustainability documentation.
    e. Deliveries.
    f. Off-site fabrication.
    g. Access.
    h. Site utilization.
    i. Temporary facilities and services.
    j. Status of correction of deficient items.
    k. Field observations.
    l. Status of RFI's, Proposal Requests, and Change Orders.
    m. Progress cleaning.
    n. Quality and work standards.
    o. Documentation of information for payment requests.
    p. Request for Information

D. Minutes: Contractor shall record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Inspector of Record, and Architect, within three days of the meeting.

E. Schedule Updating: Revise the Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule to the Owner, the Architect, and all other parties involved in the project. Failure to revise and keep current the Contractor's construction schedule may be grounds for returning Application for Payment unreviewed.

1.6 PROJECT CLOSEOUT CONFERENCE

A. Project Closeout Conference: Conduct a project closeout conference, at a time convenient to Owner and Architect, but not less than 90 days prior to the scheduled date of Substantial Completion. Conduct the conference to review requirements and responsibilities related to Project closeout.

B. Attendees: Authorized representatives of Owner, Architect and their consultants; Contractor and its superintendent. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

1. Preparation of record documents.
2. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
3. Submittal of written warranties.
4. Requirements for completing Sustainability documentation.
5. Requirements for preparing operations and maintenance data.

6. Requirements for delivery of material samples, attic stock, and spare parts.
7. Requirements for demonstration and training.
8. Preparation of Contractor's punch list.
9. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
10. Submittal procedures.
11. Responsibility for removing temporary facilities and controls.

D. Minutes: Contractor shall record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Inspector of Record, and Architect, within three days of the meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013200
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. Contractor's construction schedule.
2. Special reports.

B. Related Sections include but are not limited to the following:

1. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
2. Division 01 Section "Quality and Testing Requirements" for submitting a schedule of tests and inspections.

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 the 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. Milestone: An activity, which occurs in an instant and thus has no time duration, a key or critical point in time for reference or measurement.

1.4 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.

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 electronic copy of schedule labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

D. Construction Schedule Updating Reports: Submit with Applications for Payment.

E. Special Reports: Submit at time of unusual event.

1.5 QUALITY ASSURANCE

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Meetings." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
1. Discuss constraints, including work stages, interim milestones and multiple contracts..
2. Review delivery dates for Owner-furnished products.
3. Review schedule for work of Owner's separate contracts.
4. Review submittal requirements and procedures.
5. Review time required for review of submittals and resubmittals.
6. Review requirements for tests and inspections by independent testing and inspecting agencies.
7. Review time required for Project closeout and Owner startup procedures, including commissioning activities.

8. Review and finalize list of construction activities to be included in schedule.
9. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules with performance of construction activities and with scheduling of separate contractors.

B. Coordinate Contractor's construction schedule with the submittal schedule and other required schedules.

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 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 Division 01 Section "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. Completion: Indicate completion in advance of date established for completion, and allow time for Architect's administrative procedures necessary for certification of 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. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
4. Work Restrictions: Show the effect of the following items on the schedule:

    a. Limitations of continued occupancies.
    b. Uninterruptible services.
    c. Partial occupancy before Substantial Completion.
    d. Use of premises restrictions.
    e. Provisions for future construction.
    f. Seasonal variations.
    g. Environmental control.

5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Submittals.
    b. Purchases.
    c. Mockups.
    d. Fabrication.
    e. Sample testing.
    f. Deliveries.
    g. Installation.
    h. Tests and inspections.
    i. Adjusting.
    j. Curing.
    k. Startup and placement into final use and operation.

6. 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. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change on the overall project schedule.

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 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 current version of a program that has been developed specifically to manage construction schedules.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.

    a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.

C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.
    g. Installation.
    h. Work by Owner that may affect or be affected by Contractor's activities.
    i. Testing
    j. Commissioning.
    k. Punch list and final completion.
    l. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

    a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

E. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

2.3 SPECIAL REPORTS

A. 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.

1. Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare 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.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At progress meetings, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

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.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, Inspector of Record, 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.

END OF SECTION

SECTION 013233
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. Concealed Work photographs.
3. Periodic construction photographs.

1.3 SUBMITTALS

A. Digital Photographs: Submit image files at monthly intervals coinciding with the cutoff date associated with each Application for Payment.

1. Submit photos by uploading to Project FTP site. Include copy of key plan indicating each photograph's location and direction.
2. Identification: Provide the following information with each image description:

    a. Date photograph was taken.
    b. Description of location, vantage point, and direction.
    c. Unique sequential identifier keyed to accompanying key plan.

3. Key Plan: Include key plan of Project site and/or building(s) indicating location and direction of each photograph or group of photographs. Include same information as corresponding photographic documentation.

1.4 PHOTOGRAPHIC FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.

B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

C. File Names: Name media files with location or area photograph was taken, date, and sequential numbering suffix.

1.5 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs with maximum depth of field and in focus.

B. Key Plan: Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and adjacent areas, including existing items to remain during construction, from different vantage points, as necessary to record preconstruction conditions.

1. Take additional photographs as needed to record settlement or cracking of existing adjacent structures, pavements, and improvements.

D. Periodic Construction Photographs: Take photographs to record construction progress at not greater than bi-weekly intervals with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

E. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:

1. Underground utilities.
2. Underslab services.
3. Piping.
4. Electrical conduit.
5. Waterproofing and weather-resistant barriers.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013300
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:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
3. Cost for multiple resubmittals.

B. Related Sections:

1. Division 01 Section “Payment Procedures” for submitting Applications for Payment and the schedule of values.
2. Division 01 Section "Project Management and Coordination" for submitting coordination drawings.
3. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
4. Division 01 Section "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and final completion construction photographs.
5. Division 01 Section "Quality and Testing Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
6. Division 01 Section "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
7. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
8. Division 01 Section "Project Record Drawings" for submitting record Drawings.
9. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit as a submittal, a list 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 modifications to submittals noted by the 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. Name of subcontractor.
    d. Description of the Work covered.
    e. Scheduled date for Architect's final release or approval.
    f. Scheduled dates for purchasing.
    g. Scheduled date of fabrication.
    h. Scheduled dates for installation.
    i. Activity or event number.

1.4 SUBMITTAL FORMAT AND PROCEDURES

A. General: Prepare and submit submittals required by individual Specification Sections.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.
2. Architect will not review submittals received from sources other than the Contractor.

B. Electronic Digital Submittals: Prepare submittals as PDF package unless otherwise indicated, incorporate complete information into each PDF file, name PDF file with submittal number, and transmit submittal package to Architect via email.

1. Paper Submittals: Where paper submittals are requested, necessary, or required in lieu of electronic submittals, prepare submittals in paper form and deliver to Architect. Transmit each paper submittal using transmittal form. Comply with the following:

    a. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
    b. 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.
    c. Number of Copies: Submit not less than three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
    d. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using transmittal form.

C. Submittal Cover Page Information: Include the following information on the submittal cover page for each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Contractor.
5. Name of firm or entity that prepared submittal.
6. Names of subcontractor, manufacturer, and supplier.
7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
8. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
9. Drawing number and detail references, as appropriate.
10. Indication of full or partial submittal.
11. Location(s) where product is to be installed, as appropriate.
12. Other necessary identification.
13. Remarks.
14. Signature of transmitter.
15. Contractor’s review/approval stamp of size required by contractor, approximately 3 inches by 3 inches, on or beside title block to record Contractor's review and approval.
16. Space for Architect’s review stamp of not less than 4 inches wide by 3-1/2 inches high on or beside title block to record Architect’s review stamp and action taken by Architect.

D. Product Options:

1. Clearly identify options requiring selection by Architect.
2. Clearly identify product options required to comply with the Contract Documents.

E. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

F. Field Conditions: Indicate field conditions where applicable to the work associated with the submittal.

G. 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 timing of submitting submittals for related parts of the Work specified in different Sections so processing will not be delayed because of need to review related 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.

H. 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 14 calendar 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 14 calendar 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 calendar 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 14 calendar days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

    a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

I. 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.

J. 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.

K. Use for Construction: Retain complete copies of submittals on Project site. Use only final submittals that are marked with acceptable notation from Architect's action stamp.

1.5 SUBMITTAL REQUIREMENTS

A. 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 unsuitable 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 that show 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 Shop Drawings, and before or concurrently with Samples.

B. 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.

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. Drawing Sheet Size: Except for templates, patterns, and similar full-size Drawings, prepare 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 PDF format unless otherwise indicated.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

    a. Project name and submittal number.
    b. Generic description of Sample.
    c. Product name and name of manufacturer.
    d. Sample source.
    e. Number and title of applicable Specification Section.
    f. Specification paragraph number and generic name of each item.

3. Submit samples in PDF format unless physical samples are required.
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 (3) sets of Samples. Architect will retain two (2) 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 (3) sets of paired units that show approximate limits of variations.

D. 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.

E. 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.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit 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. Provide a notarized signature where indicated.
2. 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.
3. 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.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. 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.

H. Test and Research Reports:

1. 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.
2. 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.
3. 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.
4. 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.
5. 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.
6. 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:

    a. Name of evaluation organization.
    b. Date of evaluation.

c. Time period when report is in effect.
d. Product and manufacturers' names.
e. Description of product.
f. Test procedures and results.
g. Limitations of use.

1.6 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 insufficient 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 file(s) 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.

1.7 CONTRACTOR'S REVIEW

A. Contractor’s Review of Submittals: Contractor shall review each submittal and check for completeness, coordination with other Work of the Contract, and compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include 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.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.
2. Contractor’s approval shall certify the following actions by the Contractor:

a. Field measurements have been determined, verified, and indicated on submittal.
b. Field conditions have been verified and coordinated with Work associated with the submittal.
c. The Work associated with the submittal is in conformance with the Contract Documents.

d. Work being performed by various subcontractors and trades is coordinated with Work associated with the submittal including work being performed by others for the Owner.
e. Deviations from the Contract Documents are identified and notes.

1.8 ARCHITECT'S REVIEW

A. Architect's Review and Action: Architect will review each submittal, indicate corrections or revisions required, mark with an action stamp indicating one of the following actions, and return it.

1. Reviewed: Final unrestricted release, work may proceed, provided it complies with the Contract Documents.
2. Furnish as Corrected: Final but restricted release, work may proceed, provided written confirmation is delivered to Architect by Contractor that installed work complied with notations and corrections on submittal and with Contract Documents.
3. Revise and Resubmit: Returned for resubmittal, do not proceed with work. Revise submittal in accordance with notations thereon, and resubmit without delay to obtain an acceptable action marking. Do not allow submittals with this marking (or unmarked submittals where a marking is required) to be used in connection with performance of the Work.
4. Rejected: Submittal content varies from the Contract Documents and is not acceptable for use on the Project, do not proceed with work. Revise submittal in accordance with notations thereon, and resubmit without delay to obtain an acceptable action marking. Do not allow submittals with this marking (or unmarked submittals where a marking is required) to be used in connection with performance of the Work.

B. Non-conforming Submittals: The following are considered non-confirming submittals and will not be reviewed by the Architect.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.
2. Architect will not review submittals received from sources other than the Contractor.
3. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
4. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

C. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

1.9 COST FOR MULTIPLE RESUBMITTALS

A. Contractor's initial submittal and one resubmittal are included in the Architect's Construction Administration services to the Owner. Architect's services for review of subsequent resubmittals will be charged to the Owner at the Architect's current billing rate, and the Owner will deduct the charges from the Contract Amount by a change order.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 014000
QUALITY AND TESTING 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 including but not limited to the following:

1. General quality requirements.
2. Reports and documents.
3. Contractor’s responsibilities for testing and inspections.
4. Project Inspector.
5. Testing Agency.
6. Governing agency testing and inspection requirements.

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, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Requirements:

1. Divisions 02 through 33 Sections for specific test and inspection requirements.

D. DSA Testing and Inspection Requirements for School Construction: The following requirements are per the Division of the State Architect (DSA); requirements indicated below may be repeated elsewhere in this Section or in other Sections of the Project Manual, where conflicts occur, the most stringent condition shall apply.

1. Tests:

    a. The owner will select an independent testing laboratory, approved by DSA, to conduct the tests. Selection of the material required to be tests shall be by the laboratory or the Owner's representative and not by the Contractor.
    b. The Contractor shall notify the Owner's representative a sufficient time in advance of the manufacture of material to be supplied by him under the Contract Documents, which must by terms of the Contract be tested, in order that the Owner may arrange for the testing of same at the source of supply.
    c. Any material shipped by the Contractor from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said representative that such testing and inspection will not be required shall not be incorporated in the job.
    d. The Owner will pay testing laboratory costs for all tests and inspections, but may be reimbursed by the Contractor for such costs under the Contract documents.

2. Tests Reports: One copy of all test reports shall be forwarded to the Division of the State Architect by the testing agency. Such reports shall include all the tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Records of special sampling operations as required shall also be reported. The reports shall show that the material or materials were sampled and tested in accordance with the requirements of Title 24 and with the approved specifications. Test reports shall show the specified design strength. They shall also state defiantly whether or not the material or materials tested comply with requirements.
3. Verification of Test Reports: Each testing agency shall submit to the Division of the State Architect a verified report in duplicate covering all the tests which are required to be made by that agency during the progress of the project. Such report shall be furnished each time that work on the project is suspended, covering the tests up to that time, and at the completion of the project, covering all tests.
4. Inspection by the Owner:

    a. The Owner and his representatives shall at all times have access for the purpose of inspection to all parts of the work and to the shops wherein the work is in preparation, and the Contractor shall at all times maintain proper facilities and provide safe access for such inspection.
    b. The Owner shall have the right to reject materials and workmanship which are defective, or to require their correction. Rejected workmanship shall be satisfactorily corrected and rejected materials shall be removed from the premises without charge to the Owner. If the Contractor does no correct such rejected work within a reasonable time, fixed by written notice, the Owner may correct same and charge expense to the Contractor.

c. Should it be considered necessary or advisable by the Owner at any time before final acceptance of the entire work to make an examination of the work already completed by removing or tearing out the same, the Contractor shall on request promptly furnish all necessary facilities, labor and materials. If such work is found to be defective in any respect due to the fault of the Contractor or his subcontractor, he shall defray all expenses of such examinations and of satisfactory reconstruction. If however, such work is found to meet the requirements of the Contract, the additional cost of labor and material necessarily involved in the examination and replacement shall be allowed the Contractor.

5. Inspector – Owner's:

a. An Inspector employed by the Owner, and approved by DSA, in accordance with the requirements of the California Code of Regulations, Title 24 will be assigned to the work. His duties are specifically defined in Title 24, Part I, Sec. 4-342.
b. The work of construction in all stages of progress shall be subject to the personal continuous observation of the Inspector. He shall have free access to any or all parts of the work at any time. The Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner of the work and the character of materials. Inspection of the work shall not relieve the Contractor from any obligation to fulfill this contract.

6. Inspector – Owner – Field Office: The Contractor shall provide for the use of the Owner's Inspector a temporary office to be located as directed by the Inspector and to be maintained until removal is authorized by the Owner. This office shall of substantial water proof construction with adequate natural light and ventilation by means of stock design windows. The door shall have a lock. A table satisfactory for the study of plans and two chairs shall be provided by the Contractor. The Contractor shall provide and pay for adequate electric lights, private local telephone service with a loud exterior bell, and adequate heat for this field office until the completion of the Contract.

1.3 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, 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.

B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. 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, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

D. Mockups: Full-size physical assemblies that are constructed either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and 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 and tested at testing facility to verify performance characteristics.
2. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as freestanding temporary built elements or as indicated in-place portions of permanent construction, consisting of multiple products, assemblies, and subassemblies, with cutaways enabling inspection of concealed portions of the Work.

    a. Include each system, assembly, component, and part of the exterior wall and/or roof to be constructed for the Project. Colors of components shall be those selected by the Architect for use in the Project.

3. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
4. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.

E. 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. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.

F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. 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.

H. 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. Contractor's quality-control services do not include contract administration activities performed by Architect.

I. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

J. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 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 Statement: Submit a statement 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, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.5 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.

1.6 INFORMATIONAL SUBMITTALS

A. Reports: Prepare and submit certified written reports and documents as specified.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Reports shall be prepared by the person performing the testing and inspecting. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address 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. Governing Agency Verified Reports: Complete and submit Verified Reports as required by the Division of the State Architect and the 2022 California Administrative Code, Section 4-240. Reports are required to be completed by Architect, Architect's consulting Engineers, Owner's Project Inspector, Contractor, and Testing Agency.

1. Form:

a. DSA form DSA-6C for Contractor.
b. DSA form DSA-6PI for Project Inspector.
c. DSA form DSA-6A/E for Architect and Architect's consulting Engineers.

C. Manufacturer's Technical Representative's Field Reports: Provide written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Reports shall be prepared by Manufacturer's technical representative performing the testing and inspecting. Include the following:

1. Name, address, telephone number, and email address 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.

D. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Reports shall be prepared by Factory-authorized service representative performing the testing and inspecting. Include the following:

1. Name, address, telephone number, and email address 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.

E. 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.

1.8 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections 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. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

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 licensed to practice in the state 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. 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.

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.

G. 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.

H. 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.

I. 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 written report of each test, inspection, and similar quality-assurance service to Architect, 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.

J. 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 of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect.

3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.

    a. Allow seven days for initial review and each re-review of each mockup.

7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
10. Demolish and remove mockups when directed unless otherwise indicated.

K. Integrated Exterior Mockups: Construct integrated exterior mockup as indicated on Drawings or as specified in individual specification Sections. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials. Comply with requirements in "Mockups" Paragraph.

1. Coordinate construction of the mockup to allow observation of air barrier installation, flashings, air barrier integration with fenestration systems, and other portions of the building air/moisture barrier and drainage assemblies, prior to installation of veneer, cladding elements, and other components that will obscure the work.

1.9 PROJECT INSPECTOR

A. General: Owner will employ a Project Inspector for continuous inspection of the Work. Project Inspector shall be acceptable to Architect and approved by the Division of the State Architect.

1. Project Inspector shall act under the direction of the Architect and shall be subject to supervision by a representative of the Division of the State Architect.

B. Qualifications for Project Inspector: Qualifications for the Project Inspector shall be as stated in the California Code of Regulations, Title 24, Part 1, 2022 California Administrative Code, Section 4-333.1. Project Inspector shall be DSA certified under one of the following classes:

1. Class 1: May inspect any project.
2. Class 2: May inspect any project except a project containing one or more new large structures with a primary lateral load resisting system of steel, masonry, or concrete.

3. Class 3: May inspect projects containing alterations to approved buildings, site placement of relocatable buildings, and construction of minor structures.
4. Class 4: May inspect site placement of relocatable buildings and associated site work.

C. Duties of the Project Inspector: Duties of the Project Inspector shall be as stated in the California Code of Regulations, Title 24, Part 1, 2022 California Administrative Code, Sections 4-333(b) and 4-342, and include the following:

1. Provide continuous inspection of the work.
2. Maintain files and records of approved plans and specifications including addenda and change orders.
3. Prepare semi-monthly reports of the progress of the work and submit copies to the Architect and the Division of the State Architect.
4. Notify the Division of the State Architect at the following times:

    a. At the start of construction of the project or restart of construction if work has suspended for a period of 2 or more weeks.
    b. At least 48 hours in advance of the time when foundation trenches will be complete, ready for footing forms.
    c. At least 48 hours in advance of the first placement of foundation concrete and 24 hours in advance of any subsequent or significant concrete placement.
    d. When all work on the project has been suspended for a period of more than 2 weeks.

5. Prepare and maintain records of certain phases of construction including but not limited to the following:

    a. Concrete placing operations. Show date and time of placing concrete and the time and date of removal of forms in each portion of the structure.
    b. Welding operations. The record shall include identification marks of welders, lists of defective welds, and manner of correction of defects.

6. Notify the Contractor, in writing, of any deviations from the approved construction documents.
7. Prepare and submit Project Inspector’s Verified Report as required by DSA.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to conduct tests and inspections required by authorities having jurisdiction. Testing agency shall be acceptable to Architect and the Division of the State Architect. Requirements for tests and testing agency shall be as stated in the California Code of Regulations, Title 24, Part 1, 2022 California Administrative Code, Section 4-335.

1. Costs for testing agency services will be paid by the Owner.

2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be paid by the Owner and the amount will be deducted from the Contract Sum 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, whether specified or not.

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, whether specified or not.
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 24 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 additional copies of each written report directly to authorities having jurisdiction, when they so direct.
7. 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:

    a. Access to the Work.
    b. Incidental labor and facilities necessary to facilitate tests and inspections.
    c. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
    d. Facilities for storage and field curing of test samples.
    e. Preliminary design mix proposed for use for material mixes that require control by testing agency.
    f. Security and protection for samples and for testing and inspecting equipment at Project site.

8. Coordinate sequence of activities to accommodate required quality-assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

    a. Schedule times for tests, inspections, obtaining samples, and similar activities.

9. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.

    a. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
    b. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct tests and inspections.
4. Prepare written reports of tests and inspections, state in each report whether tested and inspected Work complies with or deviates from requirements, and submit reports of each test, inspection, and similar quality-control service to Architect, Division of the State Architect, and 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 duties of Contractor.

E. 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 Division 01 Section "Submittal Procedures."

F. 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.

1.11 TESTS AND INSPECTIONS

A. Structural Tests and Inspections shall be as specified in Division 02 through 33 Sections for specific materials and as required by form DSA-103 which lists tests and inspections required by DSA as applicable to Project conditions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 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 Division 01 Section "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

SECTION 014200
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. Architect’s approval does not release the Contractor from the responsibility to fulfill Contract requirements.

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, 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 Contract Documents 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. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.abma.com.
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.

20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
40. AWPA - American Wood Protection Association; www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI - BICSI, Inc.; www.bicsi.org.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
49. CDA - Copper Development Association; www.copper.org.
50. CEA - Canadian Electricity Association; www.electricity.ca.
51. CEA - Consumer Electronics Association; www.ce.org.
52. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
54. CGA - Compressed Gas Association; www.cganet.com.
55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
56. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
57. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
59. CPA - Composite Panel Association; www.pbmdf.com.
60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
61. CRRC - Cool Roof Rating Council; www.coolroofs.org.

62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63. CSA - Canadian Standards Association; www.csa.ca.
64. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
65. CSI - Construction Specifications Institute (The); www.csinet.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
70. DHI - Door and Hardware Institute; www.dhi.org.
71. ECA - Electronic Components Association; (See ECIA).
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
73. ECIA - Electronic Components Industry Association; www.eciaonline.org.
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. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
81. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
82. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
83. FM Approvals - FM Approvals LLC; www.fmglobal.com.
84. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
85. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
86. FSA - Fluid Sealing Association; www.fluidsealing.com.
87. FSC - Forest Stewardship Council U.S.; www.fscus.org.
88. GA - Gypsum Association; www.gypsum.org.
89. GANA - Glass Association of North America; www.glasswebsite.com.
90. GS - Green Seal; www.greenseal.org.
91. HI - Hydraulic Institute; www.pumps.org.
92. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
93. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
94. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
95. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
96. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
97. IAS - International Accreditation Service; www.iasonline.org.
98. IAS - International Approval Services; (See CSA).
99. ICBO - International Conference of Building Officials; (See ICC).
100. ICC - International Code Council; www.iccsafe.org.
101. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
102. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
103. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.

104. IEC - International Electrotechnical Commission; www.iec.ch.
105. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
106. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
107. IESNA - Illuminating Engineering Society of North America; (See IES).
108. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
109. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
110. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
111. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
112. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
113. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
114. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
115. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
116. ISO - International Organization for Standardization; www.iso.org.
117. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
118. ITU - International Telecommunication Union; www.itu.int/home.
119. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
120. LMA - Laminating Materials Association; (See CPA).
121. LPI - Lightning Protection Institute; www.lightning.org.
122. MBMA - Metal Building Manufacturers Association; www.mbma.com.
123. MCA - Metal Construction Association; www.metalconstruction.org.
124. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
125. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
126. MHIA - Material Handling Industry of America; www.mhia.org.
127. MIA - Marble Institute of America; www.marble-institute.com.
128. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
129. MPI - Master Painters Institute; www.paintinfo.com.
130. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
131. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
132. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
133. NADCA - National Air Duct Cleaners Association; www.nadca.com.
134. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
135. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
136. NBI - New Buildings Institute; www.newbuildings.org.
137. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
138. NCMA - National Concrete Masonry Association; www.ncma.org.
139. NEBB - National Environmental Balancing Bureau; www.nebb.org.
140. NECA - National Electrical Contractors Association; www.necanet.org.
141. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
142. NEMA - National Electrical Manufacturers Association; www.nema.org.
143. NETA - InterNational Electrical Testing Association; www.netaworld.org.
144. NFHS - National Federation of State High School Associations; www.nfhs.org.
145. NFPA - National Fire Protection Association; www.nfpa.org.

146. NFPA - NFPA International; (See NFPA).
147. NFRC - National Fenestration Rating Council; www.nfrc.org.
148. NHLA - National Hardwood Lumber Association; www.nhla.com.
149. NLGA - National Lumber Grades Authority; www.nlga.org.
150. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
151. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
152. NRCA - National Roofing Contractors Association; www.nrca.net.
153. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
154. NSF - NSF International; www.nsf.org.
155. NSPE - National Society of Professional Engineers; www.nspe.org.
156. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
157. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
158. NWFA - National Wood Flooring Association; www.nwfa.org.
159. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
160. PDI - Plumbing & Drainage Institute; www.pdionline.org.
161. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
162. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
163. RFCI - Resilient Floor Covering Institute; www.rfci.com.
164. RIS - Redwood Inspection Service; www.redwoodinspection.com.
165. SAE - SAE International; www.sae.org.
166. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
167. SDI - Steel Deck Institute; www.sdi.org.
168. SDI - Steel Door Institute; www.steeldoor.org.
169. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
170. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
171. SIA - Security Industry Association; www.siaonline.org.
172. SJI - Steel Joist Institute; www.steeljoist.org.
173. SMA - Screen Manufacturers Association; www.smainfo.org.
174. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
175. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
176. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
177. SPIB - Southern Pine Inspection Bureau; www.spib.org.
178. SPRI - Single Ply Roofing Industry; www.spri.org.
179. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
180. SSINA - Specialty Steel Industry of North America; www.ssina.com.
181. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
182. STI - Steel Tank Institute; www.steeltank.com.
183. SWI - Steel Window Institute; www.steelwindows.com.
184. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
185. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
186. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
187. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
188. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.

189. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
190. TMS - The Masonry Society; www.masonrysociety.org.
191. TPI - Truss Plate Institute; www.tpinst.org.
192. TPI - Turfgrass Producers International; www.turfgrasssod.org.
193. TRI - Tile Roofing Institute; www.tileroofing.org.
194. UL - Underwriters Laboratories Inc.; www.ul.com.
195. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
196. USAV - USA Volleyball; www.usavolleyball.org.
197. USGBC - U.S. Green Building Council; www.usgbc.org.
198. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
199. WASTEC - Waste Equipment Technology Association; www.wastec.org.
200. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
201. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
202. WDMA - Window & Door Manufacturers Association; www.wdma.com.
203. WI - Woodwork Institute; www.wicnet.org.
204. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
205. WWPA - 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; www.quicksearch.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; www.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; The National Academies; 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. Pharmacopeial Convention; 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. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.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.

6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. 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. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservice.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 015000
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 Requirements:

1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.
2. Division 01 Section "Multiple Contract Summary" for responsibilities for temporary facilities and controls for projects utilizing multiple contracts.
3. Division 01 Section “Fire Safety During Construction” for fire safety requirements during construction.
4. Division 31 Sections applicable to site clearing, earthwork, and trenching for temporary erosion and sedimentation control.

1.3 USE CHARGES

A. General: Installation, removal, 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, Architect, testing agencies, and authorities having jurisdiction.

B. Water Service from Existing System: Water from Owner's existing water system is available for use; provide connections and extensions of services as required for construction operations.

1. Water service is available for use without metering and without payment of use charges.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use; provide connections and extensions of services as required for construction operations.

1. Electric power service is available for use without metering and without payment of use charges.

1.4 SUBMITTALS

A. Erosion and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1. Comply with submittal requirements of Division 31 through 33 Sections as applicable for temporary erosion and sedimentation control plans.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 REGULATORY REQUIREMENTS

A. Regulatory Requirements: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. California Code of Regulations, Title 24, California Code requirements as applicable to the project.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department, and rescue squad rules.
5. Environmental protection regulations.
6. Regional Air Pollution Control District permits and requirements.
7. California Department of Water Resources, Stormwater General Permit for projects with site work area greater than one acre.
8. Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

1.7 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.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Materials for temporary facilities shall be acceptable to Architect, Owner, and Authorities having Jurisdiction (AHJ), shall be appropriate for intended use, and shall comply with governing codes and regulations.

B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts. Provide concrete or galvanized-steel bases for supporting posts.

C. Fencing Windscreen: Polyester fabric scrim with grommets for attachment to chain link fence, size and color as acceptable to, or required by, authorities having jurisdiction.

2.2 TEMPORARY FIELD OFFICE FACILITIES

A. Field Offices, General: Prefabricated or mobile units having weatherproof exteriors, lockable doors and windows, and with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Contractor's Field Office: Of sufficient size to accommodate needs of Contractor, Owner, Architect, construction personnel office activities, and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture necessary for use and storage of Project documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room or area of sufficient size to accommodate meetings of 10 individuals; furnish with conference table, chairs, and 4-foot square tack and marker boards.
3. Electrical power service, 120-VAC, with no fewer than one duplex receptacle on each wall.
4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 78 deg F.
5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
6. Communication Service and Equipment: Equip field office with phone and internet services and equipment adequate for project conditions and for use by Contractor, Architect, and Owner to access Project electronic documents and maintain electronic communications.

    a. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
    b. Equip office with not less than the following:

        1) Desktop computer with capabilities compatible with Architect's requirements. Provide external hard drive backup.

2) Printer/Copier/Scanner: Single or multiple units as needed to accommodate color printing, photocopying, and scanning.

C. Project Inspector's Field Office: Contractor shall provide temporary office facilities for the Owner's Project Inspector. Temporary facilities shall be of sufficient size to accommodate the needs of the Project Inspector and associated project records. Project Inspector facilities shall be provided with its own lockable exterior access, if interconnected with Contractor's facilities, a lockable door, controlled from the Project Inspector's side, shall be provided between the spaces. Furnish and equip office as follows:

1. Plan/layout table, 30 by 72 inches minimum.
2. File cabinets having a total capacity of not less than eight (8) legal size file drawers.
3. Open shelving/book case, 48 inches minimum in total shelving width.
4. Desk and Chair.
5. Plan rack.
6. Internet service.
7. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 78 deg F.
8. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

2.3 TEMPORARY STORAGE FACILITIES

A. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from buildings.

2.4 TEMPORARY SANITARY FACILITIES

A. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use by construction and related administrative personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities. Temporary toilets shall be self-contained, single-occupant units of the chemical, aerated recirculation type; provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material. Use of Owner's sanitary facilities is not permitted.

1. Accessible Sanitary Facilities: Sanitary facilities serving support facilities such as offices, meeting rooms, plan rooms, and serving personnel not directly associated with the actual processes of construction shall be accessible for a person using a wheelchair and shall comply with CBC Section 11B-213 (Ref. CBC 11B-201.4).

2.5 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section "Closeout Procedures."

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

3.2 INSTALLATION, GENERAL

A. Locate facilities at locations directed by the Owner 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. 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.

3.3 TEMPORARY UTILITIES AND BUILDING HVAC

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to private or municipal system as indicated on Drawings and as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

1. Existing Water Service: Where connection to Owner’s existing water service is available and allowed, clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Where temporary power service is required, install electric power service overhead unless otherwise indicated.
2. Where Owner’s existing power service is available, connect temporary service to Owner's existing power source, as directed by Owner, maintain equipment in a condition acceptable to Owner.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

H. Telephone Service: Provide temporary telephone service of sufficient size, capacity, and power characteristics required for construction operations in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment for each field office.

1. Post a list of important telephone numbers at a conspicuous location, include the following:

a. Police and fire departments.
b. Ambulance service.
c. Contractor's home office.
d. Contractor's emergency after-hours telephone number.
e. Architect's office.
f. Engineers' offices.
g. Owner's office.
h. Principal subcontractors' field and home offices.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Locate storage containers, and other temporary construction and support facilities for easy access in the areas designated and approved by the Architect and Owner. Comply with the following:

1. Do not locate temporary offices, shops, and sheds within 30 feet of building lines.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Parking areas for construction personnel shall be at location(s) as directed by Owner.

D. Dewatering: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.

E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Project Address Sign: Provide temporary project address sign as required by Authority having Jurisdiction.

2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

    a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touchup signs so they are legible at all times.

F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations.

1. Comply with requirements of the following:

    a. Authorities having jurisdiction.
    b. Division 01 Section "Execution" for progress cleaning.
    c. Division 01 Section "Construction Waste Management and Disposal."

2. Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Division 01 Section "Summary."

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements erosion and sedimentation-control Drawings, EPA Construction General Permit, or authorities having jurisdiction, whichever is more stringent.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree or plant- protection zones.

2. Inspect, repair, and maintain erosion and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

G. Security Enclosure Fence and Lockup: Before construction operations begin, furnish and install project enclosure fence in a manner that will prevent people and animals from easily entering the site except by entrance gates. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.

H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

I. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

J. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

K. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.

2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.6 MOISTURE AND MOLD CONTROL

A. General: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.

3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
    c. Remove materials that cannot be completely restored to their manufactured moisture level within 48hours.

3.7 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.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial 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 Substantial 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.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

3.8 TEMPORARY FACILITIES RESPONSIBILITY MATRIX

	Temporary Facility	Modular Building	Site Work	Shade Structure		Comments
1.	Temporary Field Office Facilities		X			
2.	Temporary Storage Facilities	X	X	X		As applicable to the work of each contractor for its own work.
3.	Temporary Sanitary Facilities		X			Provided by Site Work Contractor, available for use by all contractors.
4.	Equipment	X	X	X		As applicable to the work of each contractor for its own work.
5.	Water Service		X			Provided by Site Work Contractor, available for use by all contractors.
6.	Electric Power Service		X			Provided by Site Work Contractor, available for use by all contractors.
7.	Telephone Service	X	X	X		As applicable to the work of each contractor for its own work.
8.	Dewatering, Temporary Erosion and Sedimentation Control and Storm Water Control.		X			
9.	Project Signs		X			
10.	Waste Disposal Facilities	X	X	X		As applicable to the work of each contractor for its own work. See Division 01 Section “Construction Waste Management and Disposal.”
11.	Lifts and Hoists	X	X	X		As applicable to the work of each contractor for its own work.
12.	Tree and Plant Protection		X			
13.	Pest Control		X			
14.	Security Enclosure Fence and Lockup		X			
15.	Fire Safety	X	X			As applicable to the work of each contractor for its own work.

END OF SECTION

SECTION 015116
FIRE SAFETY DURING CONSTRUCTION

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 fire safety during construction and demolition.

B. Related Sections:

1. Division 01 Section "Temporary Facilities and Controls" for additional facilities, requirements, and procedures required during construction.

1.3 SUBMITTALS

A. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

1.4 REGULATORY REQUIREMENTS

A. Regulatory Requirements: Comply with applicable provisions of the following:

1. NFPA 241.
2. California Fire Code, 2022 Edition, Chapter 33 “Fire Safety During Construction and Demolition” and the 2022 Editions of the following California Codes as Referenced by the California Fire Code:

a. California Building Code (CBC).
b. California Mechanical Code (CMC).
c. California Plumbing Code (CPC).
d. California Electrical Code (CEC).

B. Temporary Heating Equipment (CFC 3303):

1. General: Temporary heating devices shall be listed and labeled in accordance with the California Mechanical Code. Installation, maintenance and use of temporary heating devices shall be in accordance with the terms of the listing.

2. LP-Gas heaters: Heating devices shall be temporary, self-contained, liquid-propane-gas heaters with individual space thermostatic control. Fuel supplies for liquefied petroleum gas fired heaters shall comply with the California Fire Code, Chapter 61 Liquefied Petroleum Gases, and the California Mechanical Code.
3. Refueling: Refueling operations for liquid fueled equipment or appliances shall be conducted in accordance with the California Fire Code, Section 5705. The equipment or appliance shall be allowed to cool prior to refueling.
4. Installation: Clearance to combustibles from temporary heating devices shall be maintained in accordance with the labeled equipment. When in operation, temporary heating devices shall be fixed in place and protected from damage, dislodgement or overturning in accordance with the manufacturer's instructions.
5. Supervision: The use of temporary heating devices shall be supervised and maintained only by competent personnel.
6. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

C. Precautions Against Fire (CFC 3304):

1. Smoking: Smoking shall not be allowed on the project site.
2. Combustible Debris, Rubbish and Waste:

    a. Combustible debris, rubbish and waste shall not be accumulated within buildings.
    b. Combustible debris, rubbish and waste material shall be removed from buildings at the end of each shift of work.
    c. Rubbish containers with a capacity exceeding 5.33 cubic feet (40 gallons) used for temporary storage of combustible debris, rubbish and waste materials, shall have tight fitting or self-closing lids. Such containers shall be constructed entirely of materials that are non-combustible or materials that meet a peak rate of heat release not exceeding 300 kW/m^2 when tested in accordance with ASTM E 1354 at an incident heat flux of 50 kW/m^2 in the horizontal orientation.
    d. Materials susceptible to spontaneous ignition, such as oily rags, shall be stored in a listed disposal container.

3. Burning: Burning of materials shall not be allowed on the project site.
4. Fire Watch: Where required by the fire code official, a fire watch shall be provided for building demolition and for building construction during working hours that is hazardous in nature, such as temporary heating or hot work.

    a. Trained personnel shall be provided to serve as an on-site fire watch. Fire watch personnel shall be provided with not less than one approved means for notification of the fire department, and the sole duty of such personnel shall be to perform constant patrols and watch for the occurrence of fire. The combination of fire watch duties and site security is acceptable. Fire watch personnel shall be trained in the use of portable fire extinguishers.
    b. The fire watch personnel shall keep a record of all time periods of duty, including a log entry each time the site was patrolled, and each time a structure under construction was entered and inspected. The records and log entries shall be made available for review by the fire code official upon request.

5. Cutting and Welding: Welding, cutting, open torches, and other hot work operations and equipment shall comply with California Fire Code, Chapter 35 “Welding and Other Hot Work.’
6. Temporary Wiring for Electrical Power: Temporary wiring for electrical power and lighting installations used in connection with the construction, alteration or demolition of buildings, structures, equipment or similar activities shall comply with the California Electrical Code.

D. Flammable and Combustible Liquids (CFC 3305):

1. Storage of Flammable and Combustible Liquids: Storage of flammable and combustible liquids shall be in accordance with the California Fire Code, Section 5704.
2. Class I and Class II Liquids: Storage, use, and handling of flammable and combustible liquids at construction sites shall be in accordance with the California Fire Code, Section 5706.2. Ventilation shall be provided for operations involving the application of materials containing flammable solvents.
3. Housekeeping: Flammable and combustible liquid storage areas shall be maintained clear of combustible vegetation and waste materials. Such storage areas shall not be used for the storage of combustible materials.
4. Precautions Against Fire: Sources of ignition and smoking shall be prohibited in flammable and combustible liquid storage areas. Signs shall be posted in accordance the California Fire Code, Section 310.
5. Handling at Point of Final Use: Class I and Class II liquids shall be kept in approved safety containers.
6. Leakage and Spills: Leaking vessels shall be immediately repaired or taken out of service and spills shall be cleaned up and disposed of properly.

E. Flammable Gases (CFC 3306):

1. Storage and Handling: Storage and handling of flammable gasses shall comply with the California Fire Code, Chapter 58 “Flammable Gases and Flammable Cryogenic Fluids.”
2. Cleaning with Flammable Gases: Flammable gases shall not be used to clean or remove debris from piping open to the atmosphere.

F. Explosive Materials (CFC 3307): Explosive materials shall not be allowed.

G. Owner’s Responsibility for Fire Protection (CFC 3308)

1. Program Development: The Contractor shall be responsible for the development, implementation and maintenance of a written plan establishing a fire prevention program at the project site applicable throughout all phases of the construction.
2. Program Superintendent: The Contractor shall a person to be the Fire Prevention Program Superintendent who shall be responsible for the fire prevention program and ensure that it is carried out through completion of the project. The fire prevention program superintendent shall have the authority to enforce the provisions of the California Fire Code, Chapter 33, and other provisions as necessary to secure the intent of the California Fire Code, Chapter 33. Where guard service is provided in accordance with NFPA 241, the superintendent shall be responsible for the guard service.

3. Prefire Plans: The fire prevention program superintendent shall develop and maintain an approved prefire plan in cooperation with the fire chief. The fire chief and the fire code official shall be notified of changes affecting the utilization of information contained in such prefire plans.
4. Training: Training of responsible personnel in the use of fire protection equipment shall be the responsibility of the fire prevention program superintendent. Records of training shall be kept and made a part of the written plan for the fire prevention program.
5. Fire Protection Devices: The fire prevention program superintendent shall determine that all fire protection equipment is maintained and serviced in accordance with the California Fire Code. The quantity and type of fire protection equipment shall be approved. Fire protection equipment shall be inspected in accordance with the fire prevention program.
6. Hot Work Operations: The fire prevention program superintendent shall be responsible for supervising the permit system for hot work operations in accordance with the California Fire Code, Chapter 35.
7. Impairment of Fire Protection Systems: Impairments to any fire protection system shall be in accordance with the California Fire Code, Section 901.

    a. Smoke detectors and smoke alarms located in an area where airborne construction dust is expected shall be covered to prevent exposure to dust or shall be temporarily removed. smoke detectors and alarms that were removed shall be replaced upon conclusion of dust producing work. Smoke detectors and smoke alarms that were covered shall be inspected and cleaned, as necessary, upon conclusion of dust producing work.

8. Temporary Covering of Fire Protection Devices: Temporary coverings placed on or over fire protection devices to protect them from damage during construction processes shall be immediately removed upon the completion of the construction processes in the room or area in which the devices are installed.

H. Fire Reporting (CFC 3309)

1. Emergency Telephone: Emergency telephone facilities with ready access shall be provided in an approved location at the construction site, or an approved equivalent means of communication shall be provided. The street address of the construction site and the emergency telephone number of the fire department shall be posted adjacent to the telephone. Alternatively, where an equivalent means of communication has been approved, the site address and fire department emergency telephone number shall be posted at the main entrance to the site, in guard shacks, and in the construction site office.

I. Access for Fire Fighting (CFC 3310):

1. Required Access: Approved vehicle access for firefighting shall be provided to all construction or demolition sites. Vehicle access shall be provided to within 100 feet of temporary or permanent fire department connections. Vehicle access shall be provided by either temporary or permanent roads capable of supporting vehicle loading under all weather conditions. Vehicle access shall be maintained until permanent fire apparatus access roads are available.

2. Key Boxes: Key boxes shall be provided as required by the California Fire Code, Chapter 5 “Fire Service Features.”

J. Means of Egress (CFC 3311):

1. Stairways Required: (Requirements not applicable to buildings less than 50 feet in height or less than four stories).
2. Means of Egress: Required means of egress and required accessible means of egress shall be maintained during construction and demolition, remodeling or alterations and additions to any building unless an approved temporary means of egress system is provided.

K. Water Supply for Fire Protection (CFC 3312):

1. Water Supply for Fire Protection: An approved water supply for fire protection, either temporary or permanent, shall be made available as soon as combustible material arrives on site.

L. Portable Fire Extinguishers (CFC 3315):

1. Portable Fire Extinguishers: Structures under construction, alteration or demolition shall be provided with not less than one approved portable fire extinguisher in accordance with the California Fire Code, Section 906 and sized for not less than ordinary hazard, as follows:

    a. At each stairway on all floor levels where combustible materials have accumulated.
    b. In every storage and construction shed.
    c. Additional portable fire extinguishers shall be provided where special hazards exist including, but not limited to, the storage and use of flammable and combustible liquids.

M. Motorized Construction Equipment (CFC 3316):

1. Conditions of Use: Internal combustion powered construction equipment shall be used in accordance with all of the following conditions:

    a. Equipment shall be located so that exhausts do not discharge against combustible material.
    b. Exhausts shall be piped to the outside of the building.
    c. Equipment shall not be refueled while in operation.
    d. Fuel for equipment shall be stored in approved areas outside of the building.

N. Safeguarding Roofing Operations (CFC 3317):

1. General: Roofing operations utilizing heat producing systems or other ignition sources shall be conducted in accordance with California Fire Code Sections 3317.2 and 3317.3, and Chapter 35.
2. Asphalt and Tar Kettles: Asphalt and tar kettles shall be operated in accordance with the California Fire Code, Section 303.

3. Fire Extinguishers for Roofing Operations: Fire extinguishers shall comply with the California Fire Code, Section 906. There shall be not less than one multi-purpose portable fire extinguisher with a minimum 3-A 40-B:C rating on the roof being covered or repaired.

PART 2 - PRODUCTS

2.1 TEMPORARY EQUIPMENT, GENERAL

A. Temporary Equipment: Temporary equipment shall comply with requirements of Division 01 Section “Temporary Facilities and Controls,” and shall comply with the requirements of this Section.

PART 3 - EXECUTION

A. Fire Safety Observation, Procedures, and Features: Provide fire safety observation activities, procedures, and features as required and in compliance with regulatory requirements.

END OF SECTION

SECTION 016000
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.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Division 01 Section "Substitution Procedures" for requests for substitutions.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, which is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Products: Products of a listed manufacturer that are demonstrated to meet or exceed the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified ‘Basis of Design’ product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 SUBMITTALS

A. Product Submittals: Comply with requirements in Division 01 Section "Submittal Procedures" and submittal requirements of Division 02 through 33 Sections to show compliance with product requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Warranty Submittals: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:

1. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

    a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."

2. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.

    a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
    b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.

3. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

    a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."

4. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.

    a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
    b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.

5. Basis of Design Products: Where Specifications include the phrase “Basis of Design” and lists a named manufacturer and product, provide the product indicated.

    a. Where a “Basis of Design” manufacturer/product is followed by “Subject to compliance with requirements, provide product indicated or a comparable product by one of the following,” and includes a list of manufacturers, a comparable product by one of the listed manufacturers may be provided in lieu of the basis of design manufacturer/product subject to compliance with product requirements and the following:

        1) Evidence that the proposed product:

            a) Does not require revisions to the Contract Documents.
            b) Is consistent with the Contract Documents and will produce the indicated results.
            c) Is compatible with other portions of the Work.

        2) Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
        3) Evidence that proposed product provides specified warranty.

    b. Where a “Basis of Design” manufacturer/product is followed by “Provide specified product or submit request for substitution,” comply with requirements in Division 01 Section "Substitution Procedures" for consideration of an unnamed manufacturer or product.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

    1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 017300
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. Installation of the Work.
3. Cutting, patching and repairing.
4. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.
7. Protection of existing construction.
8. Correction of the Work.

B. Related Requirements:

1. Division 01 Section "Summary of Work" for limits on use of Project site.

1.3 DEFINITIONS

A. Accessible Route: A continuous unobstructed path connecting accessible elements and spaces of an accessible site, building or facility that can be negotiated by a person with a disability using a wheelchair, and that is also safe for and usable by persons with other disabilities. Interior accessible routes may include corridors, hallways, floors, ramps, elevators and lifts. Exterior accessible routes may include accessible parking stalls and access aisles, curb ramps, crosswalks at vehicular ways, walks, ramps and lifts.

B. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

C. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 QUALITY ASSURANCE

A. Surveyor Qualifications: A professional engineer or 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 of structural elements must be performed, 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. Fire separation assemblies.
c. Air or smoke barriers.
d. Fire-suppression systems.
e. Mechanical systems piping and ducts.
f. Control systems.
g. Communication systems.
h. Fire-detection and alarm systems.
i. Conveying systems.
j. Electrical wiring systems.
k. Operating systems of special construction.

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. Sprayed fire-resistive material.
d. Equipment supports.
e. Piping, ductwork, vessels, and equipment.

4. Visual Elements: Cut and patch construction in a manner that results in no 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. 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 Division 02 trough 33 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, 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 plumbing, 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 and Owner 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. Verify service space requirements for equipment and operating items.

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 Division 01 Section "Request for Information."

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 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. 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.
3. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
4. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

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 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.

K. Repair or remove and replace damaged, defective, or nonconforming Work.

3.6 CUTTING, PATCHING, AND REPAIRING

A. General: Employ skilled workers to perform cutting, patching, and/or repairing. Proceed with cutting, patching, and repairing 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 Division 01 Section "Summary."

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 Division 31 Sections where required by cutting and patching operations.
5. Proceed with patching after construction operations requiring cutting are complete.

H. Patching and Repairing: Patch and repair construction by grinding, filling, leveling, refinishing, closing up, and similar operations following performance of other work. 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 and repaired 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.
    b. Where finishes have been removed, patch and repair substrates to receive new finishes; substrates shall be prepared to comply with requirements of manufacturer of final finish material.

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 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.

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 Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."

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 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 assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "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 Division 01 Section "Quality Requirements."

3.9 PROTECTION AND REPAIR

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. Comply with manufacturer's written instructions for temperature and relative humidity following installation.

D. Protection of Existing Items: Provide protection and ensure that existing items to remain are undisturbed by construction are maintained in condition that existed at commencement of the Work.

END OF SECTION

SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

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. Salvaging nonhazardous construction waste.
2. Recycling nonhazardous construction waste.
3. Disposing of nonhazardous construction waste.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Disposal: Removal off-site of and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

C. Recycle: Recovery of construction waste for subsequent processing in preparation for reuse.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, construction waste becomes property of Contractor.

1.5 ACTION SUBMITTALS

A. Waste Management Plan: Submit Waste Management Plan within 30 days of date established for the Notice to Proceed indicating method of compliance with the California Green Building Standards Code.

1.6 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.7 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, or individual employee assigned by the General Contractor, with a record of successful waste management coordination of projects with similar requirements. Individual of firm, or Contractor’s employee, shall be a LEED-Accredited Professional, certified by the USGBC, as waste management coordinator.

B. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of waste management coordinator.

2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.8 WASTE MANAGEMENT PLAN/REGULATORY REQUIREMENTS

A. Construction Waste Management, General: Recycle and/or salvage for reuse a minimum of 65 percent of the non-hazardous construction waste in accordance with one of the following 2022 California Green Standards Code (GBSC) Sections, or meet a local construction waste management ordinance, whichever is more stringent:

1. Construction Waste Management Plan (GBSC Section 5.408.1.1): Where a local jurisdiction does not have a construction waste management ordinance that is more stringent, provide Waste Management Plan that:

    a. Identifies the construction waste materials to be diverted from disposal by efficient usage, recycling, reuse on the project or salvage for future use or sale.
    b. Determines if construction waste materials will be sorted on-site (source separated) or bulk mixed (single stream).
    c. Identifies diversion facilities where construction waste material collected will be taken.
    d. Specifies the amount of construction waste materials diverted shall be calculated by weight or volume, but not by both.

2. Waste Management Company (GBSC Section 5.408.1.2): Utilize a waste management company that can provide verifiable documentation that the percentage of construction waste material diverted from the landfill complies with CGBSC Section 5.408.1.

    a. Exception 1: Excavated soil and land-clearing debris.
    b. Exception 2: Alternate waste reduction methods developed by working with local agencies if diversion or recycle facilities capable of compliance with this item do not exist.
    c. Demolition waste meeting local ordinance or calculated in consideration of local recycling facilities and markets.

3. Waste Stream Reduction Alternative (GBSC Section 5.408.1.3): The combined weight of new construction disposal that does not exceed two pounds per square foot of building area may be deemed to meet the 65 percent minimum requirement as approved by the enforcing agency.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management procedures. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management procedures during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Division 01 Section "Temporary Facilities and Controls."

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management procedures to everyone concerned within three days of submittal return.
2. Distribute waste management procedures to entities when they first begin work on-site. Review procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Receivers and Processors: Refer to local county websites for the county in which the Project is located for listings of available recycling receivers and processors, and materials accepted.

C. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

D. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

E. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.3 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Wood Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

3.4 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.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION

SECTION 017700
CLOSEOUT 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 administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Closeout procedures at completion.
2. Final cleaning.
3. Repair of the Work.

B. Related Requirements:

1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance documentation requirements.
2. Division 01 Section "Project Record Drawings" for preparing and submitting Project Record Drawings.
3. Division 01 Section "Warranties" for submitting final warranty information.
4. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
5. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Submit the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

2. Submit closeout documentation specified in other Division 01 Sections, including project record drawings, operation and maintenance data, construction photographic documentation, warranties, and similar final record information.
3. Submit closeout documentation specified in individual Division 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance materials specified in individual Division 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
5. Submit test/adjust/balance records.
6. Submit sustainable design submittals not previously submitted.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."
6. Advise Owner of changeover in utilities.
7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
8. Complete final cleaning requirements, including touchup painting.
9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection for Completion a minimum of 10 days prior to date the work will be completed and ready for inspection. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected.

1. Architect’s Punch List: During inspection, Architect will prepare a list of items needing completion or correction (punch list), a copy of the punch list will be distributed to the Contractor and Owner.
2. Reinspection: Request reinspection when the Work identified in previous inspection as incomplete is completed or corrected.
3. Results of completed inspection will form the basis of requirements for final completion.

E. Contractor's Cost for Reinspection: Architect will perform one inspection and one reinspection at no additional cost to the Contractor. The expense for the Architect's time for additional inspections will be paid by the Owner with the amount being deducted from the Contract Sum. The expense will be based on an hourly rate in accordance with the Architect's standard hourly rate schedule in effect at the time the work is performed with a minimum of $400.00 dollars for each additional reinspection.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect (Company name).
    d. Name of Contractor (Company Name).
    e. Page number.

4. Submit list of incomplete items in one of the following formats:

    a. MS Excel electronic file. Architect will return annotated file.
    b. PDF electronic file. Architect will return annotated file.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with the California Green Building Standards Code maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
g. Sweep concrete floors broom clean in unoccupied spaces.
h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
j. Remove labels that are not permanent.
k. Wipe surfaces of mechanical, electrical, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
p. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

1. Comply with requirements of Division 02 through 33 Sections as applicable to the Work to be restored and/or repaired.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 017823
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 documentation, including the following:

1. Operation and maintenance documentation directory manuals.
2. Emergency manuals.
3. Systems and equipment operation manuals.
4. Systems and equipment maintenance manuals.
5. Product maintenance manuals.

B. Related Sections:

1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 01 Section "Demonstration and Training" for demonstration and training materials.
3. Division 01 Section "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.
4. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 SUBMITTALS

A. Closeout Submittal: Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as previously reviewed and approved at the time of individual Section submittals; where applicable, clarify and update previously reviewed content to correspond to revisions and field conditions. Submit reviewed manual content formatted and organized as required by this Section.

1. Initial Submittal: Submit draft electronic copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether content of operations and maintenance submittal is acceptable.

a. Correct or revise each manual to comply with Architect's comments. Submit final submittal copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

2. Final Submittal: Submit in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Submit the following:

a. Paper Copy: Submit one paper-copy set of marked-up record prints that have been revised to address Architect’s comments from the initial submittal.
b. Digital Data Files: Submit digital data files of Project Record Drawings as PDF files on a thumb-drive.

B. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.4 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Electronic File Manuals: 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: Bookmark 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.

B. Paper Copy Manuals: Submit manuals in the form of hard-copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf or 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(s) 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. Enclose title pages and directories in clear plastic sleeves.
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.

1.5 REQUIREMENTS FOR 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 and in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information as applicable:

1. Subject matter included in the manual.
2. Name and address of Project.

3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for the following:

    a. Contractor.
    b. Installer.
    c. Architect.
    d. Commissioning Authority if applicable.
    e. Architect's major consultants that designed the systems contained in the manuals.

6. 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. 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."

1.6 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:

1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
2. 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.
3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.7 EMERGENCY MANUALS

A. 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.

B. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

C. 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.

D. 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.

E. 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.

1.8 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

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.

B. 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 is 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.

C. 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.

D. 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.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

1.9 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

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.

B. 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 warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identify by product name and arrange to match table of contents. For each piece of equipment, 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.

D. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; 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.

    a. 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.

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.

E. 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.

F. 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.

G. 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.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. 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.

J. 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 maintenance manuals.

1.10 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. 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.

C. Source Information: List each product included in data identified by product name and arranged to match 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.

D. 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.

E. 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.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. 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 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 017836
WARRANTIES

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 warranties required by the Contract Documents, including manufacturers' standard warranties on products and special warranties.

B. Related Sections include but are not limited to the following:

1. Division 01 Section "Closeout Procedures."
2. Division 01 Section "Operation and Maintenance Data."
3. Division 02 through 33 Sections for specific warranty requirements.

1.3 DEFINITIONS

A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special project 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.

1.4 WARRANTY REQUIREMENTS

A. 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. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

B. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

C. 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.

D. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the 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.

E. Owner's Recourse: Expressed 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. Expressed warranty periods shall not be interpreted as limitations on the 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 selection to products with warranties not in conflict with requirements of the Contract Documents.

F. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.5 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

C. Warranties: Submit (2) copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
2. Include copy of each warranty in operation and maintenance documentation.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 017839
PROJECT RECORD 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. Section includes administrative and procedural requirements for Project Record Drawings:

B. Related Sections:

1. Division 01 Section "Use of Architect's Electronic Files" for requirements related to use of Architect's digital data files.
2. Division 01 Section "Execution" for surveys of exterior accessible routes.
3. Division 01 Section "Closeout Procedures" for general closeout procedures.
4. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 RECORD DRAWING SUBMITTAL

A. Closeout Submittal: Submit Record Drawings as follows:

1. Initial Submittal: Submit one paper-copy set of marked-up record prints.

    a. Architect will indicate whether record prints are acceptable or if additional information or documentation is needed and will return the set to the Contractor.

2. Final Submittal:

    a. Paper Copy: Submit one paper-copy set of marked-up record prints that have been revised to address Architect's comments from the initial submittal.
    b. Digital Data Files: Submit digital data files of Project Record Drawings as PDF files on a thumb-drive.

1.4 PROJECT RECORD DRAWINGS

A. Record Drawings: Maintain one set of paper copies of the Contract Drawings during the construction period for Project Record Drawing Purposes.

1. Project Record Drawing print sets shall include all drawings of the Contract Documents including original project Drawings, Shop Drawings, Supplemental Drawings, Coordination Drawings, Clarification Drawings, Change Orders, and similar drawings. Record Drawing set shall include all drawings of Contract Documents whether or not changes and additional information were recorded.
2. Store Project Record Drawings in the field office apart from the Contract Documents used for construction; do not use Project Record Drawings for construction purposes.
3. Maintain Record Drawings in good order and in a clean, dry, legible condition, protected from deterioration and loss.
4. Provide access to Project Record Drawings for Architect's reference during normal working hours.
5. Incorporate new and revised drawings into Project Record Drawings as modifications are issued; do not wait until the end of Project.
6. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Accurately record information in an understandable drawing technique.
    c. Record data as soon as possible after obtaining it.
    d. Record and check the markup before enclosing concealed installations.
    e. Cross-reference record prints to corresponding archive photographic documentation.

7. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations below first floor.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Construction Change Directive.
    k. Changes made following Architect's written orders.
    l. Details not on the original Contract Drawings.
    m. Field records for variable and concealed conditions.
    n. Record information on the Work that is shown only schematically.

8. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
9. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
10. Mark important additional information that was either shown schematically or omitted from original Drawings.
11. Note Construction Change Directive numbers, Change Order numbers, and similar identification, where applicable.

B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

C. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, submit marked-up record prints to Architect, following Architect's review and action, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: PDF electronic file.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.
4. Architect will furnish Contractor one set of digital data files of the Contract Drawings in PDF format for use in recording information.

    a. Refer to Division 01 Section 011105 "Use of Architect's Electronic Files" for requirements related to use of Architect's digital data files.

D. Format:

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Record Digital Data Files:

    a. Format: Annotated PDF electronic file.
    b. Organize digital data information into separate electronic files corresponding with each building design discipline of the Contract Documents; name each file with the corresponding design discipline.

E. Identification: Include the following information on each Record Drawing:

1. "PROJECT RECORD DRAWING" designation located in a prominent location.
2. Project name if Project name is not included in a title block as part of the drawing.
3. Date.
4. Name of Architect if Architect's name is not included in a title block as part of the drawing.
5. Name of Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 017900
DEMONSTRATION AND TRAINING

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 instructing Owner's personnel in demonstration and training of operation and maintenance of systems, subsystems, and equipment.

B. Related Sections:

1. Division 01 Section “Operation and Maintenance Data” for operation and maintenance manuals and data.
2. Divisions 02 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 SUBMITTALS

A. Training materials in addition to Operation and Maintenance manuals required in Division 01 Section “Operation and Maintenance Data.”

B. Instruction Program Schedule: Submit outline schedule of instructional program that includes and coordinates programs for all products, equipment, and systems requiring demonstration and training. Schedule shall include a list of training sessions, proposed dates, times, length of instruction time.

1. Schedule shall be coordinated and finalized with the Owner.

1.4 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative experienced in operation and maintenance procedures and training of Owner’s personnel.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner, adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training sessions with content of approved operation and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Provide instruction programs that include training sessions for each system and for equipment not part of a system, as required by individual Specification Sections. Include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Operating standards.
    c. Regulatory requirements.
    d. Equipment function.
    e. Operating characteristics.
    f. Limiting conditions.
    g. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project record documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.
    l. Required sequences for electric or electronic systems.
    m. Special operating instructions and procedures.

5. Adjustments: Include the following:

    a. Alignments.
    b. Checking adjustments.
    c. Noise and vibration adjustments.
    d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

    a. Diagnostic instructions.
    b. Test and inspection procedures.

7. Maintenance: Include the following:

    a. Inspection procedures.
    b. Types of cleaning agents to be used and methods of cleaning.
    c. List of cleaning agents and methods of cleaning detrimental to product.
    d. Procedures for routine cleaning
    e. Procedures for preventive maintenance.
    f. Procedures for routine maintenance.
    g. Instruction on use of special tools.

8. Repairs: Include the following:

    a. Diagnosis instructions.
    b. Repair instructions.
    c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
    d. Instructions for identifying parts and components.
    e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction and training. Assemble training manuals organized in coordination with requirements in Division 01 Section "Operations and Maintenance Data."

B. Coordinate with Owner for number of instruction times, location, and number of participants.

C. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule initial training with Owner**,** through Architect with at least 7 days' advance notice.

C. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION

SECTION 018113
SUSTAINABLE DESIGN REQUIREMENTS, DSA CALGREEN

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 requirements and procedures for compliance with the 2022 California Green Building Standards Code (CGBSC) for Division of the State Architect (DSA) requirements.

B. Related Sections:

1. Project Manual Appendix No. 2, DSA Project Submittal Guideline GL-4.

1.3 SUBMITTALS

A. Submit Sustainable Design Requirement submittals as required by Division 02 through 33 Specification Sections. Submittals may include, but are not limited to, the following:

1. Construction Waste Management Plan and other submittals as required by Division 01 Section "Construction Waste Management and Disposal."
2. Air Quality: Product data for filtration media.
3. Product data for adhesives, sealants, and coatings indicating VOC content of each product used.
4. Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

1.4 REGULATORY REQUIREMENTS

A. DSA's "Project Submittal Guideline: CalGreen Code," form GL-4 (https://www.dgs.ca.gov/-/media/Divisions/DSA/Publications/guidelines/GL_4.pdf?la=en&hash=056C301E3592D09DC9C59DA146D04216AF108A9D). Contractor's responsibility with regard to sustainable design requirements shall include, but not be limited, to the following requirements of the 2022 California Green Building Standards Code).

B. Outdoor Lighting: Outdoor lighting shall be designed and installed to comply with requirements of the 2022 CGBSC, Section 5.106.8.

C. Energy Efficiency: Comply with requirements of the California Energy Code and as indicated on the Drawings.

D. Plumbing Fixtures: Plumbing Fixtures shall comply with requirements of the 2022 CGBSC, Section 5.303.3.

E. Moisture Control: Irrigation systems shall be designed and installed to prevent spray on buildings; per requirements of the 2022 CGBSC, Section 5.407.2.1.

F. Construction Waste Management: Comply with requirements of the 2022 CGBSC, Section 5.408.1 and Division 01 Section "Construction Waste Management and Disposal." Construction Waste Management shall include, but not be limited to, the following:

1. Construction Waste Management Plan.
2. Recycling, reuse, and/or salvaging non-hazardous construction waste.

G. Environmental Quality/Pollutant Control: Comply with requirements of the 2022 CGBSC, Sections as follows:

1. Section 5.504.3, Covering of Duct Openings and Protection of Mechanical equipment. At the time of rough installation and during storage on the construction site until final startup of the heating, cooling and ventilating equipment, all duct and other related air distribution component openings shall be covered with tape, plastic, sheet metal or other methods acceptable to the enforcing agency to reduce the amount of dust, water and debris which may enter the system.
2. Section 5.504.4.1, Adhesives and Sealants: Adhesives and sealants shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

    a. Adhesives: 2022 CGBSC Table 5.504.4.1 Adhesive VOC Limit:

        1) Indoor Carpet Adhesives: 50 g/L.
        2) Carpet Pad Adhesives: 50 g/L.
        3) Rubber Floor Adhesives: 60 g/L.
        4) Wood Flooring Adhesive: 100 g/L.
        5) Subfloor Adhesives: 50 g/L.
        6) Ceramic Tile Adhesives: 65 g/L.
        7) VCT and Asphalt Tile Adhesives: 50 g/L.
        8) Gypsum Board and Panel Adhesives: 50 g/L.
        9) Cove Base Adhesives: 50 g/L.
        10) Multipurpose Construction Adhesives: 70 g/L.
        11) Structural Glazing Adhesives: 100 g/L.
        12) Single-Ply Roof Membrane Adhesive: 250 g/L.
        13) Other Adhesives not specifically listed: 50 g/L.
        14) PVC Welding Compounds: 510 g/L.
        15) CPVC Welding Compounds: 490 g/L.
        16) ABS Welding Compounds: 325 g/L.
        17) Plastic Cement Welding Compounds: 250 g/L.
        18) Adhesive Primer for Plastic: 550 g/L.

19) Contact Adhesive: 80 g/L.
20) Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine-covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
21) Structural Wood Member Adhesive: 140 g/L.
22) Top and Trim Adhesive: 250 g/L.
23) Metal-to-Metal Adhesives: 30 g/L.
24) Plastic Foam Adhesives: 50 g/L.
25) Adhesives for Porous Materials (Except Wood): 50 g/L.
26) Wood Glues: 30 g/L.
27) Fiberglass Adhesives: 80 g/L.

b. Sealants: 2022 CGBSC Table 5.504.4.2, Sealant VOC Limit:

1) Architectural Sealants: 250 g/L.
2) Nonmembrane Roof Sealants: 300 g/L.
3) Paving Sealants: 250 g/L.
4) Single-Ply Roof Membrane Sealants: 450 g/L.
5) Other Sealants: 420 g/L.
6) Sealant Primers for Nonporous Substrates: 250 g/L.
7) Sealant Primers for Porous Substrates: 775 g/L.
8) Modified Bituminous Sealant Primers: 500 g/L.
9) Other Sealant Primers: 750 g/L.

3. Section 5.504.4.3, Paints and Coatings: Architectural Coatings shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Paints and Coatings: 2022 CGBSC Table 5.504.4.3, VOC Content Limits for Architectural Coatings:

1) Flat Paints and Coatings: VOC not more than 50 g/L.
2) Nonflat Paints and Coatings: VOC not more than 100 g/L.
3) Nonflat High-Gloss Paints and Coatings: VOC not more than 150 g/L.
4) Dry-Fog Coatings: VOC not more than 150 g/L.
5) Floor Coatings: VOC not more than 100 g/L.
6) Pretreatment Wash Primers: VOC not more than 420 g/L.
7) Primers, Sealers, and Undercoaters: VOC not more than 100 g/L.
8) Rust Preventative Coatings Applied to Ferrous Metals: VOC not more than 250 g/L.
9) Shellacs, Clear: VOC not more than 730 g/L.
10) Shellacs, Pigmented: VOC not more than 550 g/L.
11) Stains: VOC not more than 250 g/L.
12) Clear Wood Finishes, Varnishes: VOC not more than 275 g/L.
13) Clear Wood Finishes, Lacquers: VOC not more than 275 g/L.
14) Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.

4. Section 5.504.4.3.1, Aerosol Paints and Coatings: Aerosol paints and coatings shall meet the PWMIR Limits for ROC in Section 94522(a)(3) and other requirements, including prohibitions on use of certain toxic compounds and ozone depleting substances, in Sections 94522(c)(2) and (d)(2) of California Code of Regulations, Title 17, commencing with Section 94520; and in areas under the jurisdiction of the Bay Area Air Quality Management District additionally comply with the percent VOC by weight of product limits of Regulation 8 Rule 49. Comply with requirements of 2022 CGBSC, Table 5.504.4.3.

H. Carpet Systems: Comply with requirements of CGBSC, Section 5.504.4.4.

1. All carpet installed in the building interior shall meet the requirements of 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 (Emissions testing method for California Specification 01350).

a. See California Department of Public Health’s website for certification programs and testing labs.

2. Carpet Adhesive: VOC content not exceeding 50 g/L per CGBSC Table 5.504.4.1 when calculated according to 40 CFR 59, Subpart D (EPA Method 24)

I. Composite Wood Products: Comply with requirements of CGBSC Section 5.504.4.5; 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 by the ATCM must meet the specified emission limits, as shown in CGBSC Table 5.504.4.5.

J. Resilient Flooring Systems: Comply with requirements CGBSC, Section 5.504.4.6.

1. Where resilient flooring is installed, at least 80% of floor area receiving resilient flooring shall meet the requirements of 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 (Emissions testing method for California Specification 01350).

2. Resilient Floor Adhesive: VOC content not exceeding 50 g/L per CGBSC Table 5.504.4.1 when calculated according to 40 CFR 59, Subpart D (EPA Method 24)

K. HVAC Filters: Comply with requirements CGBSC, Section 5.504.5.3; in mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media for outside and return air prior to occupancy that provides at least a Minimum Efficiency Reporting Value (MERV) of 13. MERV 13 filters shall be installed prior to occupancy and recommendations for maintenance with filters of the same value shall be included in the operation and maintenance manual.

1. Exception: Existing mechanical equipment.

2. Labeling: Installed filters shall be clearly labeled by the manufacturer indicating the MERV rating.

L. Outside Air Delivery: Comply with requirements CGBSC, Section 5.506.1; for mechanically or naturally ventilated spaces in buildings, meet the minimum requirements of Section 120.1 (Requirements For Ventilation) of the 2022 California Energy Code, or the applicable local code, whichever is more stringent, and Division 1, Chapter 4 of CCR, Title 8.

M. Acoustical Control: Comply with requirements CGBSC, Section 5.507.4, employ building assemblies and components with Sound Transmission Class (STC) values determined in accordance with ASTM E 90 and ASTM E 413 or Outdoor–Indoor Sound Transmission Class (OITC) determined in accordance with ASTM E 1332, using either the prescriptive or performance method in CGBSC Section 5.507.4.1 or 5.507.4.2.

1. Exception:

a. Buildings with few or no occupants or where occupants are not likely to be affected by exterior noise, as determined by the enforcement authority, such as factories, stadiums, storage, enclosed parking structures and utility buildings.
b. Exception: For public schools and community colleges, the requirements of CGBSC Section 5.507.4, and all subsections, apply only to new construction.

N. Interior Sound Transmission: Comply with requirements CGBSC, Section 5.507.4.3; wall and floor-ceiling assemblies separating tenant spaces and tenant spaces and public places shall have an STC of at least 40.

O. Ozone Depletion and Greenhouse Gas Reductions: Comply with requirements CGBSC, Section 5.508.1; installation of HVAC, refrigeration, and fire suppression equipment shall comply with CGBSC Sections 5.508.1.1 and 5.508.1.2.

1. Chlorofluorocarbons (CFCs): Install HVAC, refrigeration and fire suppression equipment that do not contain CFCs.
2. Halons: Install HVAC, refrigeration and fire suppression equipment that do not contain Halons.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 019113
GENERAL COMMISSIONING 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.

B. Owner's Project Requirements (OPR) and Basis of Design (BoD) documentation are included by reference for information only.

1.2 SUMMARY

A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.

B. Related Sections:

1. Division 23 Section "Commissioning of HVAC Systems" for commissioning process activities for HVAC systems, assemblies, equipment, and components.

1.3 DEFINITIONS

A. 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 includes both narrative descriptions and lists of individual items that support the design process.

B. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

C. CxA: Commissioning Authority.

D. 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.

E. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.4 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): 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 each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:

1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

1.5 OWNER'S RESPONSIBILITIES

A. Provide the OPR documentation to the CxA and each Contractor for information and use.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

C. Provide the BoD documentation, prepared by Architect and approved by Owner, to the CxA and each Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.6 EACH CONTRACTOR'S RESPONSIBILITIES

A. Each Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
3. Attend commissioning team meetings held on a regularly scheduled basis.
4. Integrate and coordinate commissioning process activities with construction schedule.
5. Review and accept construction checklists provided by the CxA.
6. Complete paper and/or electronic construction checklists as Work is completed and provide to the Commissioning Authority on a predetermined daily or weekly basis.
7. Review and accept commissioning process test procedures provided by the Commissioning Authority.
8. Complete commissioning process test procedures.

1.7 CxA'S RESPONSIBILITIES

A. Organize and lead the commissioning team.

B. Provide commissioning plan.

C. Convene commissioning team meetings.

D. Provide Project-specific construction checklists and commissioning process test procedures.

E. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log.

F. Prepare and maintain the Issues Log.

G. Prepare and maintain completed construction checklist log.

H. Witness systems, assemblies, equipment, and component startup.

I. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 023000
SUBSURFACE INVESTIGATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes information for the Geotechnical Investigation Report prepared for this Project.

B. Related Sections:

1. Division 31 Sections as applicable to site clearing, earthwork, excavations, fill, trenching, and paving.

1.3 GEOTECHNICAL REPORT

A. A Geotechnical report for this project is currently underway. For reference only, a copy of a recent Geotechnical Investigation Report of an adjacent site is contained in the Appendix of this Project Manual.

B. A Geotechnical report for the Building has been prepared by:

Techincon, Inc.
4539 N. Brawley Ave. # 108
Fresno, CA 93722
(559) 276-9344

TES No. 240426.001

C. N/A.

D. The Geotechnical Investigation Report identifies subsurface soil and ground water conditions and offers recommendations for earthwork and preparation of subsurface conditions for the Work of this Project.

E. The Geotechnical Investigation Report is not a warranty of subsurface conditions. Should subsurface conditions be found to vary substantially from the Report, changes in design and construction of foundations may be made by the Architect, with resulting credits or expenditures to the Contract sum accruing to the Owner.

1.4 QUALITY ASSURANCE

A. A soil engineer will be retained by the Owner to observe performance of work in connection with excavating, trenching, filling, backfilling, and grading, and to perform compaction tests.

1. Requirements for Field Quality Control are included in individual Sections as applicable to excavating, trenching, filling, backfilling, and grading.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 024119
SELECTIVE DEMOLITION

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 the following:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused, recycled, or returned to Owner.

B. Related Sections include the following:

1. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
2. Division 01 Section "Photographic Documentation" for photographic documentation of pre-demolition conditions.
3. Division 01 Section "Execution" for cutting and patching procedures.
4. Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of nonhazardous demolition and construction waste.
5. Division 09 Sections as applicable to adhered floor systems.
6. Prior to Bid Owner will provide “Asbestos & Lead Inspection Report” for the results of the inspection of the existing project conditions and materials.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be salvaged or reinstalled.

B. Remove and Salvage to Owner: Detach item from existing construction in a manner to prevent damage and deliver to Owner ready for reuse.

C. Remove and Salvage for Reinstallation: Detach item from existing construction in a manner to prevent damage, prepare for reuse, and securely store item until it is to be reinstalled at locations indicated.

D. Existing to Remain: Existing items or improvements that are to remain and not be removed. Existing items to remain shall be protected from damage during the course of construction.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 SUBMITTALS

A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for physical damage, for dust control, and for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

C. Qualification Data: For refrigerant recovery technician.

D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

E. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.6 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

C. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to selective demolition.

1.7 FIELD CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: Hazardous materials are known to be present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

E. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

F. Storage or sale of removed items or materials on-site is not permitted.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

1. If unanticipated mechanical, electrical, or structural elements are encountered and found to be in conflict with intended function or design, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

C. Inventory and record the condition of items to be removed and salvaged or removed and reinstalled. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.

3.2 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

3.3 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.4 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. HVAC Equipment Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

B. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

C. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off utilities with Owner and/or utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use plasma or flame cutting torches without written approval from Architect. Where allowed, clear area of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations. Maintain fire watch during and for at least two hours after flame-cutting operations. Maintain adequate ventilation when using cutting torches.
5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
6. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
7. Dispose of demolished items and materials promptly, comply with requirements of Division 01 Section “Construction Waste Management and Disposal.”

B. Minor Accessories and Fixtures: Remove minor accessories and fixtures as required to accommodate removal of existing finishes or application new finishes whether items are indicated to be removed or not.

1. Minor accessories and fixtures shall include but not be limited to toilet room accessories; classroom accessories such as pencil sharpeners coat hooks, flag holders, and similar items.
2. Where new replacement items are not indicated or specified in other sections, minor accessories and fixtures shall be considered to be items to be removed and reinstalled.

C. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

1. Items removed, salvaged, and reinstalled for the Contractor's convenience shall be considered the same as items to be removed and salvaged for reinstallation.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete Slabs-on-Grade: Using power-driven saw, cut perimeter of area to be demolished, then break up and remove.

1. Where possible or feasible, cut concrete at existing joints.

B. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

C. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. Refer to applicable Division 07 Section for new roofing requirements.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Recycle or dispose demolition waste materials according to Division 01 Section "Construction Waste Management and Disposal." Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in accordance with local regulations and in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Slabs-on-grade.

B. Related Sections:

1. Division 01 Section “Quality and Testing Requirements” for administrative and procedural requirements for quality assurance including independent testing requirements.
2. Division 03 Section "Concrete Cure-Sealer-Hardener.”
3. Division 03 Section "Polished Concrete Finishing” for concrete slabs that are to be polished.
4. Division 22 and 23 Sections as applicable to Plumbing and Mechanical items embedded in concrete.
5. Division 26 Sections as applicable to Electrical items embedded in concrete.
6. Division 31 Sections as applicable to earthwork.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

1. Shop drawings shall be in accordance with ACI SP-66 or CRSI “Manual of Standard Practice.”
2. Mill certificates: Steel producer's certificates of mill analysis, tensile, and bend tests for reinforcing steel. Submit certificates accompanying the Shop Drawings.

D. Construction Joint Layout Shop Drawings: Show locations of proposed construction and control joints other than, or in addition to, those as indicated on the drawings. Location of joints is subject to approval of the Architect.

E. Qualification Data: For the Ready-mixed concrete manufacturer, include copies of applicable ACI certificates.

F. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Waterstops.
6. Curing compounds.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Semirigid joint filler.
11. Joint-filler strips.
12. Repair materials.

G. Material Test Reports: For aggregates, from a qualified testing agency, indicating compliance with requirements:

H. Mill certificates: Steel producer's certificates of mill analysis, tensile, and bend tests for reinforcing steel. Submit certificates accompanying the Shop Drawings.

I. Steel Reinforcement Record Drawings: Shop drawings shall be corrected to reflect actual field changes and shall be submitted to the Architect.

J. Welding certificates.

K. Delivery Tags: Delivery tags for all concrete.

L. Batch Plant Inspection Waiver: When batch plant inspection waiver is requested, evidence of compliance shall be submitted to, and approved by, the Governing Agency; refer to requirements in Part 3 Article “Field Quality Control.”

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel who shall be thoroughly familiar with the specified requirements, completely trained and experienced in the necessary skills required for work performed under this Section. In actual installation of the work of this Section, use adequate numbers of skilled workmen to insure installation in strict accordance with the contract documents design.

B. Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer shall be certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency: An independent agency retained by the Owner, acceptable to the Architect, and qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 318-14, “Building Code Requirements for Structural Concrete” with amendments per 2022 California Building Code, Chapter 19A, Section 1905A.
3. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Mockups: Cast concrete slab-on-grade panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.

1. Build panel approximately 200 sq. ft. for slab-on-grade in the location indicated or, if not indicated, as directed by Architect.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

H. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction joints, control joints, isolation joints, joint-filler strips, and semirigid joint fillers.
c. Steel reinforcement installation.
d. Anchor rod and anchorage device installation tolerances.
e. Cold and hot weather concreting procedures.
f. Concrete finishes and finishing.
g. Curing procedures.
h. Forms and form-removal limitations.
i. Shoring and reshoring procedures.
j. Methods for achieving specified floor and slab flatness and levelness.
k. Floor and slab flatness and levelness measurements.
l. Concrete repair procedures.
m. Concrete protection.
n. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
o. Protection of field cured field test cylinders.
p. Concrete mixtures, finishing, and curing of slabs to receive a polished finish.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Identification: Bundle and tag reinforcing steel with grades and suitable identification marks for checking, sorting and placing. Use waterproof tags and markings and do not remove until steel is in place.

1.7 COORDINATION

A. Slab Finishes: Coordinate slab finish requirements with trades installing or applying floor finishes or treatments over slabs. Finishes shall include but not be limited to concrete sealing, ceramic tile, resinous/fluid applied floor systems, adhered resilient floor systems, and adhered carpet.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Earth Forms: Use for sides of footings only where soil is firm and stable and concrete will not be exposed. Where earth forms are used, cut excavations neat and accurate to size for placing concrete directly against the excavation.

B. Rough-Formed Finished Concrete: Use for formed concrete that will not be exposed in the finished work, fabricate forms of plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Smooth-Formed Finished Concrete: Use for formed concrete that will be exposed in the finished work, fabricate forms of form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, F_u=80$_{ksi}$ deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.

D. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. Slabs on Grade and Foundations: Use precast concrete blocks, plastic-coated steel with bearing plates or specifically designed wire-fabric supports fabricated of plastic. Precast blocks shall be not less than 3 inches by 3 inches square and shall have a compressive strength equal to or greater than the strength of the surrounding concrete.
2. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

F. Fabricating Reinforcement: Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice" or ACI SP-66 and the details shown on the Drawings.

1. In the case of fabricating errors, do not rebend or straighten reinforcement in a manner that will damage or weaken the material.
2. Bends shall be made cold using pin sizes as recommended ACI 318 as modified by T24, CCR, Part 2.
3. Unacceptable Work: Reinforcement with any of the following defects will not be permitted:

a. Bar lengths, depths, and bends exceeding specified fabrication tolerance.
b. Bends or kinks not indicated on the project Drawings or the final Shop Drawings.
c. Bars with reduced cross-section due to excessive rusting or other cause.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type II, gray.

a. ASTM C 150, Type V where concrete will be in contact with corrosive soils or mixed with aggregates containing reactive substances. Low alkali cement shall contain not more than 0.6 percent total alkali when calculated as sodium oxide as determined by the method given in ASTM C114.
b. Fly Ash: ASTM C 618, Class F. The use of a quality fly ash will be permitted as a cement-reducing admixture up to a maximum of 15% of the weight of portland-cement.

B. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.

1. Where concrete expansion from alkali silica or alkali carbonate reactions is anticipated, provide aggregate with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
2. Fine and coarse aggregates shall be regarded as separate ingredients. Each size of coarse aggregate, as well as the combination of sizes when two or more are used, shall conform to the grading requirements of ASTM C33.
3. Coarse aggregate: Coarse aggregate shall consist of a clean, hard, fine grained, sound crushed rock, or washed gravel or a combination of both. It shall be free from oil, organic matter, or other deleterious substances. Aggregate shall be uniformly graded from one-quarter inch size to maximum size.
4. The maximum size of aggregates used in the project shall be consistent with the dimensions and form of the section being placed, the location and spacing of the reinforcing bars, and with the method of compaction, and shall be such as will produce dense and uniform concrete free from rock pockets, honey-comb and other irregularities. The nominal maximum size of the aggregate shall not be more than one-fifth the narrowest dimension between forms, one-third the depth of slabs nor three-fourths the minimum clear spacing between reinforcing bars.
5. Combined Grading: The combined grading shall be such that the percentage by weight of the combined aggregates shall fall within the limits established as follows:

Sieve number or size in inches (maximum)	Percentage by Weight		
	1-1/2”	1”	3/4”
Passing a 2 inch	---	---	---
Passing a 1-1/2 inch	95-100	---	---
Passing a 1 inch	70-90	90-100	---
Passing a 3/4 inch	50-80	70-95	90-100
Passing a 3/8 inch	40-60	45-70	55-75
Passing a No. 4	35-55	35-55	40-60
Passing a No. 8	25-40	27-45	30-46
Passing a No. 16	16-34	20-38	23-40
Passing a No. 30	12-25	12-27	13-28
Passing a No. 50	2-12	5-15	5-15
Passing a No. 100	0-3	0-5	0-5

6. Special grading or size limitations: When reviewed and approved by the Architect, other gradings or maximum size limitations may be used if mixes are designed and tested in accordance with the concrete mixture specified in the “Concrete Mixtures” Article.
7. Soundness of Aggregates: Both the coarse and fine aggregate shall be tested by the use of a solution of sodium or magnesium sulfate, or both, whenever in the judgment of the Architect, such tests are necessary to determine the quality of the material. Such tests shall be performed in accordance with ASTM C88 and the results shall show compliance with the limits set forth in ASTM C33.
8. Reactivity: Aggregates shall be free from any substance which may be deleteriously reactive with the alkalies in the cement in an amount sufficient to cause excessive expansion of the concrete or which will interfere with normal hydration of the cement. Acceptability of the aggregate shall be based upon satisfactory evidence that the aggregate is free from such materials.
9. Aggregates shall be tested, when required by the Architect prior to the concrete mix being established, in accordance with the following specifications:

Test	Specification
Abrasion	ASTM C131 and C535
Gradation	ASTM C136
Alkali Reactivity	ASTM C289 and C227
Organic Impurities	ASTM C40
Clay Lumps	ASTM C142

10. Maximum Coarse-Aggregate Size: Nominal size as indicated on Drawings.
11. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.4 ADMIXTURES

A. Admixtures shall be reviewed and approved by the Architect and the Division of the State Architect.

B. Admixtures for concrete slabs to receive a polished finish shall be limited to, and coordinated with, Division 03 Section “Polished Concrete Finishing.”

C. Calcium chloride, thiocyanates or admixtures containing more than 0.05% chloride ions are not permitted.

D. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Certification of requirements and chloride ion content is required from the admixture manufacturer prior to mix design review.

1. Air-entraining Admixture: ASTM C260.

a. Available Products: Subject to compliance with requirements, provide one of the following products:

1) Euclid Chemical Company (The); Air Mix.
2) BASF/Master Builders, Inc.; Micro-Air.
3) Sika Corporation; Sika AER.

2. Water-reducing Admixtures: ASTM C494 Type A.

a. Available Products: Subject to compliance with requirements, provide one of the following products:

1) Euclid Chemical Company (The); Eucon WR-75.
2) BASF/Master Builders Inc.; Pozzolith 220N.
3) Sika Corporation; Plastocrete 161.

3. Water-reducing, Retarding Admixtures: ASTM C494 Type D.

a. Available Products: Subject to compliance with requirements, provide one of the following products:

1) Euclid Chemical Company (The); Eucon Retarder-75.
2) BASF/Master Builders Inc.; Pozzolith 300 R.
3) Sika Corporation; Plastiment.

4. High Range Water-Reducing Admixture (HRWR): ASTM C494 type F or G.

a. Available Products: Subject to compliance with requirements, provide one of the following products:

1) Euclid Chemical Company (The); Eucon 37.
2) BASF/Master Builders Inc.; Rheobuild 1000.
3) Sika Corporation; Sikament 300.

b. When more than 30 minutes is required between the addition of admixtures to final placement of the concrete, a combination of water-reducing, set controlling admixtures (ASTM C494, Types A, D and E) may be used.

5. Non-Corrosive, Non-Chloride Accelerator: ASTM C494 Type C or E.

a. Available Products: Subject to compliance with requirements, provide one of the following products:

1) Euclid Chemical Company (The); Accelguard 80.
2) BASF/Master Builders Inc.; Pozzutec 20+.
3) Sika Corporation, Plastocrete 161FL.

b. The admixture manufacturer shall have long-term (more than one year duration) non-corrosive test data on metal deck and reinforcing steel from an independent testing laboratory using an acceptable accelerated corrosion test method such as using electrical potential measures.

2.5 CURING AND SEALING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Construction Chemicals - Building Systems; Confilm.
b. ChemMasters; SprayFilm.
c. Conspec by Dayton Superior; Aquafilm.
d. Dayton Superior Corporation; Sure Film (J-74).
e. Edoco by Dayton Superior; BurkeFilm.
f. Euclid Chemical Company (The), an RPM company; Eucobar.
g. Lambert Corporation; LAMBCO Skin.
h. L&M Construction Chemicals, Inc.; E-CON.
i. Meadows, W. R., Inc.; EVAPRE.
j. Sika Corporation; SikaFilm.
k. Symons by Dayton Superior; Finishing Aid.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, clear or white polyethylene film, 6 mil minimum thickness, or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Construction Chemicals - Building Systems; Kure 200.
b. ChemMasters; Safe-Cure Clear.
c. Conspec by Dayton Superior; W.B. Resin Cure.
d. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
e. Edoco by Dayton Superior; Res X Cure WB.
f. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
g. L&M Construction Chemicals, Inc.; L&M Cure R.
h. Meadows, W. R., Inc.; 1100-CLEAR.
i. Symons by Dayton Superior; Resi-Chem Clear.

2. Curing compounds are subject to removal after curing period has elapsed; refer to Part 3 Article “Concrete Protecting and Curing.”

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Construction Chemicals - Building Systems; Kure 1315.
b. ChemMasters; Polyseal WB.
c. Conspec by Dayton Superior; Sealcure 1315 WB.
d. Edoco by Dayton Superior; Cureseal 1315 WB.
e. Euclid Chemical Company (The), an RPM company; Super Diamond Clear VOX; LusterSeal WB 300.
f. Meadows, W. R., Inc.; Vocomp-30.
g. Symons by Dayton Superior; Cure & Seal 31 Percent E.

2. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:

2.7 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.8 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301, ACI 318, Chapter 26; and Chapter 19A of the California Building Code.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

    a. The testing agency used for preparing mixture designs shall be different from the testing agency retained by the Owner for testing concrete strength and materials.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 15 percent.

    a. limit fly ash to 10% maximum for concrete floor slabs to be polished.

C. Limit water-soluble, chloride-ion content in hardened concrete to the following percentages by weight of cement.

1. Prestressed concrete: 0.06 percent.
2. Reinforced concrete exposed to chloride in service: 0.15 percent.
3. Reinforced concrete that will be dry or protected from moisture in service: 1.00 percent.
4. Other reinforced concrete: 0.30 percent.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.9 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Concrete slab on grade and footings to be in accordance with:
1. Geo-tech Report by Technicon Engineering Services, TES No. 240426.001, dated September 20, 2024
Allowable Soil Bearing Pressure is 2,000 psf (DL+LL) Per earthwork and grading recommendations found within Geo-Tech report. Minimum embedment below lowest adjacent grade is 12” & Min. footing width is 12”. Site is to be prepared in accordance with Geo-Tech report.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Project site mixing of structural concrete will not be permitted. Project site mixing of concrete for other purposes may be permitted only when reviewed and approved by the Architect. When allowed, measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ACI 318. Mix concrete materials in appropriate drum-type batch machine mixer, the capacity of the mixer shall be such that it will handle one or more full sack batches.

C. Control of Admixtures:

1. Admixtures shall be charged into the mixer as solutions and shall be measured by means of an approved mechanical dispensing device. The liquid shall be considered a part of the mixing water. Admixtures that cannot be added in solution may be weighed or may be measured by volume if so recommended by the manufacturer.

2. If two or more admixtures are used in the concrete, they shall be added separately to avoid possible interaction that might interfere with the efficiency of either admixture or adversely affect the concrete.
3. Addition of retarding admixtures shall be completed within 1 minute after addition of water to the cement has been completed, or prior to the beginning of the last three-quarters of the required mixing, whichever occurs first.
4. Admixtures shall be used in accordance with the manufacturer's instructions.

D. Concrete shall be mixed only in quantities for immediate use. Concrete which has set shall not be retempered, but shall be discarded.

E. When concrete arrives at the project with slump below that suitable for placing, as indicated by the specifications, water may be added only if neither the maximum permissible water-cement ratio nor the maximum slump is exceeded. The water shall be incorporated by additional mixing equal to at least half of the total mixing required. An addition of water shall be accompanied by a quantity of cement sufficient to maintain the proper water-cement ratio. Such addition shall be reviewed by the Architect.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

1. Where earth is used for forming sides of footings, increase the width of footings by 1 inch on each side of the footing.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

B. Conduits and Pipes Embedded in Concrete:

1. Pipes, other than conduits for electrical circuits, shall not be embedded in structural concrete unless specifically reviewed and approved by the Architect and the Division of the State Architect. Any pipe or conduit may pass through any walls or floor slab by means of a sleeve so located that it does not impair the strength of the structure. Openings larger than 12 inches in any dimension shall be as detailed on the structural plans.
2. Unless otherwise approved, embedded pipes or conduits, other than those merely passing through, shall be not larger in outside dimension than one-third the thickness of the slab, wall, or beam in which they are embedded, nor shall they be spaced closer than three diameters or widths on center and shall have at least 1-1/2 inches concrete cover.
3. Sleeves, pipes, or conduits of aluminum shall not be embedded in structural concrete unless effectively coated or covered to prevent aluminum-concrete reaction or electrolytic action between aluminum and steel.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete must be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 STEEL REINFORCEMENT

A. Quality Control: Reinforcement steel and placement shall be subject to inspection and testing per Part 3 Article “Field Quality Control.”

B. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

C. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

D. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

    a. Use only grooved joints for concrete surfaces that will be permanently exposed to view.

2. 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 concrete develops random contraction cracks.

    a. Sawn joints shall not be used for concrete surfaces that will be permanently exposed to view.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.6 CONVEYING

A. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.

B. Conveying equipment shall be of a size and design such that detectable setting of concrete shall not occur before adjacent concrete is placed. Conveying equipment shall be cleaned at the end of each operation or work day. Conveying equipment and operations shall conform to the following additional requirements:

1. Truck mixers, agitators and non-agitating units and their manner of operation shall conform to the applicable requirements of ASTM C94.
2. Belt conveyors shall be horizontal or at a slope which will not cause excessive segregation or loss of ingredients. Concrete shall be protected against undue drying or rise in temperature. A suitable device shall be used at the discharge end to prevent apparent segregation. Mortar shall not be allowed to adhere to the

return length of the belt. Long runs shall be discharged into a hopper or through a baffle.

3. Do not use reinforcement or reinforcement supports to support runways for concrete conveying equipment.

C. Chutes shall be metal or metal-lined and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long and chutes not meeting the slope requirements may be used provided they discharge into a hopper before distribution.

D. Pumping or pneumatic conveying equipment shall be of suitable kind with adequate pumping capacity. Pneumatic placement shall be controlled so that segregation is not apparent in the discharged concrete. The loss of slump in pumping or pneumatic conveying equipment shall not exceed 2 inches. Concrete shall not be conveyed through pipe made of aluminum or aluminum alloy. When the concrete is placed into final position by means of pumping, the pumping method for placing concrete shall be reviewed and approved by the Architect and the Division of the State Architect at least one week prior to placing the concrete.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

1. Reposition any misaligned reinforcement.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Deposit concrete continuously in one layer or in horizontal 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 a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. 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 operations 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 surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306.1 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 average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 305 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water 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. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not permanently exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces permanently exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture

matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Finishing of concrete floor slabs to receive a polished finish shall be coordinated with division 03 Section “Polished Concrete Finishing.”

C. Slab Finishes: Provide finished slab surfaces as indicated below; confirm and coordinate surface finishes for adhered and fluid applied floor finishes with trades installing/applying respective floor systems required for the project conditions.

	Finish Floor Application	Slab Finish Type
1.	Surfaces to receive mortar setting beds for tile flooring and similar applications.	Scratch Finish
2.	Surfaces to receive thinset tile flooring directly over concrete	Trowel and Fine Broom Finish
3.	Surfaces to receive adhered carpet, resilient sheet, or resilient tile flooring	Trowel and Fine Broom Finish
4.	Surfaces to receive epoxy or polyurethane fluid applied flooring	Light Broom Finish (Confirm with floor system manufacturer)
5.	Surfaces to be exposed and sealed concrete	Troweled Finish
6.	Ramped exposed concrete	Medium Broom Finish
7.	Surfaces to receive waterproof membranes	Floated Finish
8.	Surfaces to receive a polished finish; Coordinate with Division 03 Section “Polished Concrete Finishing.”	Smooth trowel finish, not burned

D. Slab Flatness (F_F) and Levelness (F_L): Provide finished slab flatness and levelness as indicated below; confirm and coordinate surface finishes for floor finishes with trades installing/applying respective floor systems required for the project conditions.

	Application		Flatness (F_F)	Levelness (F_L)
1.	Multi-Use Room (Assembly Space)	Overall: Local:	40 28	30 22
2.	Classrooms (Other than polished	Overall:	30	25

	concrete floor areas)	Local:	24	15
3.	Slabs to receive polished concrete finish, Coordinate with Division 03 Section “Polished Concrete Finish-ing.”	Overall: Local:	50 40	30 20
4.	Slabs to receive resilient flooring	Overall: Local:	30 24	25 15
5.	Slabs to receive carpet flooring	Overall: Local:	25 17	20 15
6.	Other areas not specified	Overall: Local:	25 17	20 15

E. Sloped Slab Finishes: Where slabs are indicated to be sloped, finished slabs shall have a slope not to exceed 1/4 inch per one foot unless otherwise indicted on the Drawings.

F. Slab Finish Types: Slab finish types shall be as follows:

1. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
2. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing.
3. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Trowel and Fine-Broom Finish: After applying a trowel finish and while concrete is still plastic, slightly scarify surface with a fine broom to produce a fine directional finish.
5. Broom Finish: Immediately after float finishing, slightly roughen surface by brooming with fiber-bristle broom perpendicular to main traffic route and/or ramp surfaces. Coordinate required final finish with Architect before application.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.11 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h 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.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days using a water saturated absorptive cover kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

    a. This method shall not be used on floor slabs receiving adhered floor systems, fluid applied floor systems, or sealers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

    a. Use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    b. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. 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. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a 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. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 LIQUID FLOOR TREATMENTS

A. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

    1. Defer joint filling as long as possible and until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

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, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.

    a. Limit cut depth to 3/4 inch.
    b. Make edges of cuts perpendicular to concrete surface.
    c. Perimeters of cut areas shall be square or rectangular in shape with cuts vertical and horizontal.
    d. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried.
    e. Fill form-tie voids with patching mortar or cone 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, patching mortar will match surrounding color. Patch a test area at inconspicuous locations 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 surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas 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 repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair 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. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. 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 a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. 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 patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

A. Testing and Inspecting Agency: Owner will engage and pay for a qualified independent testing and inspecting agency to perform tests and inspections as applicable and prepare reports.

1. Testing and Inspection Agency shall be acceptable to the Architect and the Division of the State Architect.

B. The Architect and the Division of the State Architect shall have the right to order the testing of any materials used in the concrete construction to determine if they are of the quality specified.

C. Contractor Responsibilities:

1. The Contractor shall maintain control of the quality of materials and workmanship in order to conform with the drawings and specifications.
2. To facilitate testing and inspection, the Contractor shall:

a. Schedule tests and inspections with the Testing and Inspection Agency sufficiently in advance of operations to allow for the assignment of personnel and for the completion of testing and inspecting responsibilities.
b. Provide access to the Work for the designated Testing and Inspection Agency.
c. Furnish all necessary materials and labor to assist the designated Testing and Inspection Agency in obtaining and handling samples at the project or other sources of materials.
d. Provide and maintain for the sole use of the Testing and Inspection Agency adequate facilities for safe storage and proper curing of concrete test specimens on the project site for the first 24 hr. as required by ASTM C31.

3. The Contractor shall correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

D. Testing and Inspection Services:

1. Testing and inspections shall be performed by the designated Testing and Inspection Agency.
2. Testing and inspections shall be in accordance with the 2022 California Building Code, Section 1705A.3 and Table 1705A.3, DSA Statement of Structural Tests and Inspections form DSA 103, Structural Drawings Special Inspection Criteria, and shall include but not be limited to the following:

    a. Inspection of steel reinforcement.
    b. Inspection of headed bolts and studs prior and during concrete placement.
    c. Verification of use of required design mixture.
    d. Sampling of concrete for strength tests, slump, air content, and temperature of concrete at time of placement.
    e. Inspection of concrete placement, including conveying and depositing.
    f. Inspection of curing procedures and maintenance of curing temperature.
    g. Verification of concrete strength before removal of shores and forms from beams and slabs.
    h. Inspection of formwork.

E. Sampling and Testing of Steel Reinforcement:

1. Samples of reinforcing steel shall be taken by a designated approved testing agency at place of distribution prior to shipment or at project site.
2. Where samples are taken from bundles as delivered from the mill, with the bundles identified as to heat number and provided the mill analyses accompany the report, one tensile test and one bend test shall be made from a specimen from each 10 tons or fraction thereof of each size of reinforcing steel.

    a. Where positive identification of the heat number cannot be made or where random samples are to be taken, one series of tests shall be made from each 2-1/2 tons or fraction thereof of each size of reinforcing steel.

3. Each sample shall consist of no fewer than two pieces, each 18 inches long, of each size and grade or reinforcing steel.

F. Batch Plant Inspection: The quality and quantity of materials used in transit mixed concrete and in batched aggregates shall be continuously inspected at the location where materials are measured by an approved Testing and Inspection Agency.

1. Waiver of Batch Plant Inspection: Continuous batch plant inspection will not be required under the following conditions:

    a. The concrete plant complies fully with the requirements of ASTM C94, Sections 8 and 9, and has a current certificate from the National Ready Mixed Concrete Association. The certification shall indicate that the plant has automatic batching and recording capabilities.
    b. The Testing Agency shall check the first batching at the start of work and furnish mix proportions to the licensed weighmaster.
    c. Licensed weighmaster shall positively identify materials as to quantity and certify to each load by a ticket.
    d. Tickets shall be transmitted to the Contractor by cement truck driver with load identified thereon. Do not accept loads without a load ticket identifying

the mix; Contractor shall keep a daily record of placements identifying each truck, its load and time of receipt, and approximate location of deposit in the structure and will transmit a copy of the daily record to the Architect.

e. At the end of the project, the weighmaster shall furnish an affidavit to the Architect certifying that all concrete furnished conforms in every particular to proportions established by mix designs.

f. The Testing Agency shall certify and submit evidence of compliance to the governing agency Division of the State Architect and obtain governing agency's approval prior for a waiver of batch plant inspection prior to mixing the concrete.

G. Placement Record: A record shall be kept on-site of the time and date of placing the concrete in each portion of the structure. Such record shall be kept until the completion of the structure and shall be open to the inspection of the governing agency (Division of the State Architect).

H. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture but not less than one sample for each 50 cu. yd. or fraction thereof and one sample for each 2,000 square feet of slab area.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure four standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at 7 days for information and two cured specimens at 28 days for strength acceptance, the fourth specimen shall be held in reserve in case additional testing in necessary.

    a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
8. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7 and 28-day tests.
9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
11. Additional testing and inspecting will be performed to determine compliance of replaced or additional work with specified requirements.

    a. The cost of additional testing and inspection of replaced work will be paid for by the Owner with the amount being deducted from the Contract Amount by a Change Order.

3.16 PROTECTION OF SEALED FLOORS

A. Protect sealed floor surfaces from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by floor treatment installer.

END OF SECTION

SECTION 033518
CONCRETE CURE-SEALER-HARDENER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Single application cure-sealer-hardener for new concrete floors.
2. Precautions for avoiding staining concrete before and after application.

B. Related Sections:

1. Division 03 Section “Cast-In-Place Concrete.”

1.3 REFERENCES

A. ASTM International (ASTM):

1. ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
2. ASTM C779 Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
3. ASTM C805 Standard Test Method for Rebound Number of Hardened Concrete.
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 D3359 Standard Test Methods for Measuring Adhesion by Tape Test.
6. ASTM G23 Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials (Withdrawn 2000).

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For qualified installer.

C. Maintenance Data: Maintenance instructions, including precautions for avoiding staining after application.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who is certified in writing by manufacturer as qualified to install manufacturer's products.

B. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

1.6 DELIVERY, STORAGE & HANDLING

A. Delivery: Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

B. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

C. Handling: Protect materials from dirt, corrosion, oil, grease and other contaminants.

PART 2 - PRODUCTS

2.1 CURE-SEAL-HARDENER

A. Basis of Design: Drawings and Specifications are based on the following:

1. Curecrete Distribution, Inc.; Ashford Formula.

a. Subject to compliance with requirements, submit specified product or a comparable product subject to request for substitution.

B. Cure-Seal-Hardener: Water-based chemically reactive penetrating sealer and hardener that seals by densifying concrete so that water molecules cannot pass through but air and water vapor can, and allows concrete to achieve full compressive strength, minimizing surface crazing and eliminating dusting.

1. Abrasion Resistance to Revolving Disks: At least a 32.5% improvement over untreated samples when tested in accordance with ASTM C779.
2. Surface Adhesion: At least a 22% increase in adhesion for epoxy when tested in accordance with ASTM D3359.
3. Hardening: As follows when tested in accordance with ASTM C39:

a. After 7 Days: An increase of at least 40% over untreated samples.
b. After 28 Days: An increase of at least 38% over untreated samples.

4. Coefficient of Friction: 0.86 dry, 0.69 wet when tested in accordance with ASTM C1028.
5. Rebound Number: An increase of at least 13.3% over untreated samples when tested in accordance with ASTM C805.

6. Light Exposure Degradation: No evidence of adverse effects on treated samples when tested in accordance with ASTM G23.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for conditions affecting performance of the Work of this Section.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Do not use frozen material. Thaw and agitate prior to use.

D. If construction equipment must be used for application, diaper all components that might drip oil, hydraulic fluid or other liquids.

3.3 INSTALLATION

A. General: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

1. Apply cure-seal-hardener to exposed interior concrete floor slabs indicated to have a sealed concrete finish.

B. New Concrete: Apply cure-seal-hardener to new concrete as soon as the concrete is firm enough to work on after troweling.

1. Spray on at rate of 200 ft^2/gal (5 m^2/L).
2. Keep surface wet with cure-seal-hardener for a minimum soak-in period of 30 minutes without allowing it to dry out or become slippery. In hot weather, slipperiness may appear before the 30 minute time period has elapsed, if slipperiness occurs, apply additional cure-seal-hardener as needed to keep the entire surface in a non-slippery state for the first 15 minutes. For the remaining 15 minutes, mist the surface as needed with water to keep the material in a non-slippery state. In hot weather conditions, follow manufacturer's special application procedures.
3. When the treated surface becomes slippery after this period, lightly mist with water until slipperiness disappears.

4. Wait for surface to become slippery again, and then flush entire surface with water to remove all cure-seal-hardener residue.
5. Squeegee surface completely dry, flushing any remaining slippery areas until no residue remains.
6. Wet vacuum or scrubbing machines may be used in accordance with manufacturer’s instructions to remove residue.

3.4 PROTECTION

A. Protect installed floors for at least 3 months until chemical reaction process is complete.

1. Do not allow traffic on floors for 3 hours after application.
2. Do not allow parking of vehicles on concrete slab.
3. If vehicles must be temporarily parked on slab, place dropcloths under vehicles during entire time parked.
4. Do not allow pipe cutting using pipe cutting machinery on concrete slab.
5. Do not allow temporary placement and storage of steel members on concrete slabs.
6. Clean up spills immediately and spot-treat stains with degreaser or oil emulsifier.
7. Clean floor regularly in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 061000
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:

1. Framing with dimension lumber.
2. Framing with timber.
3. Wood blocking and nailers.
4. Framing with engineered wood products.
5. Rooftop equipment bases and support curbs.
6. Plywood backing panels for telecommunications equipment.
7. Wood furring.

B. Related Sections:

1. Division 06 Section “Plywood Panel Sheathing” for structural use panel sheathing.
2. Division 27 Electrical specifications as applicable for plywood backing panels for telecommunications backboard panels.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Exposed Framing: Framing not concealed by other construction.

D. Timber: Lumber of 5 inches nominal or greater in least dimension.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Research/Evaluation Reports: From ICC-ES or IAPMO ES, for the following:

1. Wood-preservative-treated wood.
2. Engineered wood products.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Post installed concrete anchors.
6. Metal framing anchors.

1.5 REFERENCED CODES AND STANDARDS

A. California Code of Regulations, Title 24, Part 2, California Building Code, 2022 Edition.

B. American Wood Council (AWC):

1. National Design Specification for Wood Construction with commentary, (ANSI/AWC NDS-2018).
2. Special Design Provisions for Wind and Seismic with commentary, (ANSI/AWC SDPWS-2015).

C. Lumber grading agencies and abbreviations:

1. NLGA: National Lumber Grades Authority.
2. WCLIB: West Coast Lumber Inspection Bureau.
3. WWPA: Western Wood Products Association.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stockpile materials sufficiently in advance of need to assure their availability in a timely manner for Work.

B. Use extreme care in off-loading of lumber to prevent damage, splitting, and breaking of materials.

C. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

D. Identify framing lumber by grade and store each grade separately from other grades.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Provide dressed lumber, S4S, unless otherwise indicated.

B. Moisture Content of Lumber: 19 percent maximum unless otherwise indicated.

C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1, Use Category UC2, for interior construction not in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar members in contact with masonry or concrete.

3. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
4. Wood plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. Framing Lumber; Studs, Joists, and Rafters: Douglas Fir, WCLIB or WWPA, No. 1 or better, unless otherwise indicated on Drawings.

2.4 TIMBER FRAMING

A. Timber Framing: Douglas Fir, WCLIB or WWPA, No. 1 or better, unless otherwise indicated on Drawings.

2.5 ENGINEERED WOOD PRODUCTS

A. Engineered Wood Products, General: Engineered Wood Products shall contain no urea formaldehyde.

B. Source Limitations: Obtain each type of engineered wood product from a single source from a single manufacturer.

C. Manufacturer and Products: Provide products as indicated on Drawings.

1. Project structural design based on products indicated on Drawings, changes or substitutions will require a Request for Substitution and a Construction Change Document.

D. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

1. Extreme Fiber Stress in Bending, Edgewise: As indicated on Structural Drawings.
2. Modulus of Elasticity, Edgewise: As indicated on Structural Drawings.

E. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

1. Extreme Fiber Stress in Bending, Edgewise: As indicated on Structural Drawings.
2. Modulus of Elasticity, Edgewise: As indicated on Structural Drawings.

F. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Provide units complying with material requirements of and with structural capacities established and monitored according to ASTM D 5055.

1. Web Material: Either oriented strand board or plywood, complying with DOC PS 1 or DOC PS 2, Exposure 1.
2. Structural Properties: Provide units with depths and design values not less than those indicated on Drawings.

G. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research/evaluation report for I-joists.

1. Manufacturer: Provide products by same manufacturer as I-joists.
2. Material: All-veneer product, glued-laminated wood, or product made from any combination solid lumber, wood strands, and veneers.
3. Thickness: As indicated on Structural Drawings.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C ('A' face exposed to room), 3/4 inch nominal thickness.

1. Equipment backing panels to be finished with intumescent paint specified in Division 09 Section Painting or shall panels shall fire retardant treated plywood.

2.7 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber as indicated on Drawings, as required for project conditions, and as required for support or attachment of other construction, including but not limited to blocking, nailers, support curbs, and furring.

B. Dimension Lumber Items: Provide lumber of species and grade matching framing lumber.

1. For blocking not used for attachment of other construction, Utility or Stud grade lumber may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
2. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

C. Boards: Provide lumber of 19 percent maximum moisture content (S-DRY).

1. Exposed Boards: Where boards will not be concealed by other work or where painted finish is indicated, provide Select Merchantable Boards per WCLIP rules.
2. Concealed Boards: Where boards will be concealed by other work, provide any species graded construction boards or WCLIP No. 1 or better.

D. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.8 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Fasteners in contact with preservative treated wood, including nuts and washers, shall be of hot dipped galvanized steel, stainless steel, or silicon bronze; the coating weights for zinc-coated fasteners shall be in accordance with ASTM A 153. Fasteners other than nails, timber rivets, wood screws, and lag screws shall be permitted to be of mechanically deposited zinc-coated steel with coating weights in accordance with ASTM B 695, Class 55 minimum; comply with requirements of 2022 CBC 2304.10.6.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

G. Post Installed Concrete Anchors: Fabricated from corrosion-resistant materials; manufacturer, size, and type as indicated on Drawings and specified in Division 03 Section “Post Installed Concrete Anchors.” Materials to comply with the following:

1. Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

2.9 METAL FRAMING ANCHORS AND HARDWARE

A. General: Connectors in contact with preservative treated or fire retardant treated wood shall be of hot dipped galvanized steel or stainless steel; the coating weights for zinc-coated connectors shall be in accordance with ASTM A 153; comply with requirements of 2022 CBC 2304.10.6.

B. Basis of Design Manufacturer: Provide products as indicated on Drawings manufactured by the following:

1. Simpson Strong-Tie Co., Inc.

C. Material: Galvanized steel sheet, hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

1. Use for interior locations unless otherwise indicated.

2.10 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. General: Install framing as indicated on drawings, as herein specified, and as required to comply with regulatory agencies and American Forest and Paper Association (AF&PA) document WCD 1 "Details for Conventional Wood Frame Construction". Notes and details on Drawings shall take precedence over these specifications.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install plywood backing panels with classification marking of testing agency exposed to view.

E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

F. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

G. Do not splice structural members between supports, unless otherwise indicated.

H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches on center.

I. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities in accordance with 2022 CBC Section 718 “Concealed Spaces” and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches on center with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches on center Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- thickness.
3. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet on center

J. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

K. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

L. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated on Drawings and complying with the following:

1. ICC ESR-1539 for power-driven staples and nails.
2. 2022 CBC Table 2304.10.2 “Fastening Schedule.”

M. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

N. Fasteners and connectors in contact with preservative treated or fire retardant treated wood shall be corrosion resistant as specified under Part 2 product requirements.

O. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Comply with fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
2. Use finishing nails, unless otherwise indicated.

3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- size furring vertically at 16 inches on center

3.4 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide studs, top and bottom plates of sizes indicated on Drawings, 2 inch minimum nominal thickness.

1. Studs: Members of size and spacing indicated on Drawings.
2. Top Plates: Double top plate of width equal that of studs.
3. Bottom Plates: Single bottom plate of width equal that of studs; fasten plates to supporting construction as indicated on Drawings.
4. Mid-Height Blocking: Provide continuous horizontal blocking at mid-height of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as studs.

B. Construct corners and intersections with three or more studs.

C. Frame openings as indicated on Drawings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on double-jamb studs for openings 60 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated.

3.5 CEILING JOIST FRAMING INSTALLATION

A. Ceiling Joist Framing: Install ceiling joists as indicated on Drawings with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.

1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail short joist to ends of rafters and to top plate, and nail to first joist or anchor with framing anchors or metal straps. Provide 2-by-4-inch nominal size stringers spaced 48 inches on center crosswise over main ceiling joists.

3.6 RAFTER FRAMING INSTALLATION

A. Rafter Framing: Install rafter framing as indicated on Drawings. Notch to fit exterior wall plates and use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

B. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.

3.7 TIMBER FRAMING INSTALLATION

A. Install timber beams with crown edge up and provide not less than 4 inches of bearing on supports. Provide continuous members, unless otherwise indicated; tie together over supports as indicated if not continuous.

B. Install wood posts using metal anchors indicated.

3.8 PROTECTION

A. Use all necessary means to protect the installed work and materials of all other trades. In the event of damage, immediately make all repairs and replacements necessary to, the approval of the Architect and at no additional cost to the Owner.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 061600
PLYWOOD PANEL SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.

B. Related Sections include the following:

1. Division 06 Section "Rough Carpentry" for plywood equipment backing panels.
2. Division 07 Section “Weather Resistive Barriers” for weather resistive barriers applied over wall sheathing.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PLYWOOD SHEATHING, ROOF AND/OR WALLS

A. Plywood Sheathing: Either DOC PS 1 or DOC PS 2, Exposure 1, structural sheathing unless otherwise indicated.

1. Span Rating: As indicated on Drawings.
2. Nominal Thickness: As indicated on Drawings.

B. Factory mark panels to indicate compliance with applicable standard.

2.2 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Fasteners used for the attachment of exterior roof and/or wall sheathing, and fasteners in contact with preservative treated or fire retardant treated wood, including nuts and washers, shall be of hot dipped galvanized steel, stainless steel, or silicon bronze; the coating weights for zinc-coated fasteners shall be in accordance with ASTM A 153. The coating weights for mechanically deposited zinc-coated steel fasteners shall be in accordance with ASTM B 695, Class 55 minimum. Comply with requirements of 2022 CBC 2304.10.2 and 2304.10.6.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Sheathing to Wood Framing: ANSI/ASME B18.6.1.

A. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 1513 and SAE J78, length as recommended by screw manufacturer for material being fastened, screws shall penetrate steel material greater than 33 mils by not less than 3 exposed threads.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

C. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

F. Space panels 1/8 inch apart at edges and ends.

G. Fastening: Securely fasten panels to framing by fastening as indicated on Drawings complying with the following:

1. Wood Framing: Comply with the following:

   a. ICC ESR-1539P for power-driven fasteners.
   b. 2022 California Building Code, Table 2304.10.2 “Fastening Schedule.”
   c. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

2. Metal Framing: Screw to cold-formed metal framing.

END OF SECTION

SECTION 064116
PLASTIC LAMINATE CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Plastic-laminate faced architectural cabinets.
2. Plastic-laminate countertops.

B. Related Sections:

1. Division 06 Section “Rough Carpentry” for blocking required for installing cabinets and concealed within other construction before cabinet installation.
2. Division 06 Section “Solid Surface Counter Tops” for solid surface material counter tops.
3. Division 10 Section “Marker Boards” for horizontal sliding marker boards integrated within casework.

1.3 SUBMITTALS

A. Product Data: For each type of product, including cabinet hardware and accessories.

1. Provide documentation VOC content for adhesives.
2. Provide documentation that wood panel products and bonding adhesives contain no urea formaldehyde.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
2. Show locations and sizes of cutouts and holes for plumbing fixtures and other items installed in architectural woodwork.
3. Apply WI-certified compliance label to first page of Shop Drawings.

C. Samples for Initial Selection:

1. Plastic laminates.
2. PVC edge material.

D. Samples for Verification:

1. Plastic Laminate and Edge Banding: One sample, 8 by 10 inches, for each type, color, pattern, and surface finish with sample applied to core material and specified edge material applied to 1 edge.
2. Cabinet hardware, one unit for each type and finish of the following:

a. Pulls.
b. Hinges.
c. Catches.
d. Locks.
e. Shelf supports.

E. Woodwork Quality Standard Compliance Certificates: WI-certified compliance certificates.

F. Extra Stock:

1. Deliver to Owner an additional 0.5% of each color of plastic laminate used.

a. Extra stock shall be full sheets wherever possible; not scrap material.

2. Provide Owner with one additional box (100 count) of shelf clips.
3. Provide six (6) pairs of standard hinges
4. Provide one box (50 count) standard screw anchors
5. Provide six (6) pairs of standard door pulls

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project, who are familiar with Woodwork Institute fabrication requirements, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Installer shall be fabricator of plastic laminate casework or fabricator shall be responsible for the Work of the installer. Installers shall be skilled workers who are experienced installing products similar to those required for this Project, who are familiar with Woodwork Institute installation requirements, and have a record of successful in-service performance.

C. Woodwork Institute (WI) Quality Assurance Program: Plastic Laminate Casework shall be subject to the following WI quality assurance program:

1. Certified Compliance Program (CCP):

a. A WI Certified Compliance Label shall be affixed to the first page of the original shop drawing set.
b. A WI Certified Compliance Certificate shall be issued for plastic laminate cabinets, counter tops and installation.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver casework until painting and similar operations that could damage casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements, Seismic Design: Comply with requirements of the California Building Code, Part 2, Volume 2, Chapter 16A (State Chapter) “Structural Design Requirements,” Sections 1613A.1 and 1617A, ASCE Section 7-16, Table 13.6-1, and WI construction methods for seismic design for schools and hospitals.

B. Regulatory Requirements, Accessibility: Casework shall comply with accessibility requirements of the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) 2010 ADA Standards for Accessible Design and with the 2022 California Building Code, Chapter 11B, “Accessibility to Public Buildings, Public Accommodations, Commercial Buildings, and Public Housing.” Accessible casework shall comply with the following:

1. Counter Top Heights for Sinks and Lavatories: Where self-rimming sinks or lavatories are installed in counter tops and the fixtures are indicated to be accessible, counter top heights shall be verified and coordinated so that the top rim of sinks and lavatories shall not be more than 34 inches above the finished floor; for self-rimming sinks, counter top heights shall be set at +33-1/2 inches above the finish floor level.
2. Knee and Toe Space at Sink Counter Tops (Ref. CBC 11B-306):

    a. Width: 30 inches minimum clear width.
    b. Vertical Clearance: 27 inches minimum at the front edge of counter tops.
    c. Depth of Knee and Toe Clearance: Measured from the front edge of counter tops.

        1) Depth at Floor Level: 19 inches minimum / 25 inches maximum; and not less than the reach depth over the counter top.
        2) Depth at +9 Inches: Depth at floor level less 6 inches maximum (13 inches minimum depth at +9 inches for a clear space depth of 19 inches at floor level; depth increases as depth at floor level increases).
        3) Depth at +27 Inches: Depth at floor level less 9 inches maximum (10 inches minimum depth at +27 inches for a clear space depth of 19 inches at floor level; depth increases as depth at floor level increases).

3. Knee and Toe Space at Lavatory Counter Tops (Ref. CBC 11B-306):

    a. Width: 30 inches minimum clear width.
    b. Vertical Clearance: 29 inches minimum at the front edge of counter tops.

c. Depth of Knee and Toe Clearance: Measured from the front edge of counter tops.

1) Depth at Floor Level: 17 inches minimum / 19 inches maximum; and not less than the reach depth over the counter top; actual depth may exceed 19 inches although it may not be considered as additional accessible toe space.
2) Depth at +9 Inches: Depth at floor level less 6 inches maximum (11 inches minimum depth at +9 inches for a clear space depth of 17 inches at floor level; depth increases as depth at floor level increases).
3) Depth at +27 Inches: Depth at floor level less 9 inches maximum (8 inches minimum depth at +27 inches for a clear space depth of 17 inches at floor level; depth increases as depth at floor level increases).

4. Side Reach Depth Over Counter Tops (Ref. CBC 11B-308.3.2): Where casework is to be accessible, casework shall be fabricated such that the side reach depth does not exceed 24 inches measured from the front edge of the counter top to the finished surface of the wall at the back of the counter top. Counter top heights shall not exceed 34 inches from the finished floor surface.

C. Quality Standard: Unless otherwise indicated, comply with Woodwork Institute's (WI) "North American Architectural Woodwork Standards" (NAAWS), latest edition, for grades of architectural plastic-laminate cabinets and counter tops indicated for construction, finishes, installation, and other requirements.

D. Seismic Design: Fabrication shall comply with referenced seismic design requirements.

2.2 PLASTIC-LAMINATE CABINETS

A. Quality Standard: Unless otherwise indicated, comply with WI's "North American Architectural Woodwork Standards," latest edition, Section 10 "Casework" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

1. Grade: Custom Grade except where Premium Grade requirements indicated.
2. Provide labels and certificates from the Woodwork Institute (WI) certification program indicating that woodwork, including installation, complies with requirements of grades specified.
3. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard indicated.

B. Fabricate casework as multiple self-supporting units rigidly joined together or as single-length sections to fit access openings.

1. Cabinet bodies shall be fabricated using dowel and confirmat screw construction with glued joints.

C. Type of Construction: Type A, Frameless.

D. Cabinet, Door, and Drawer Front Interface Style: Style 1, flush overlay.

E. Laminate Cladding for Exposed Exterior and Exposed Interior Surfaces: NEMA LD 3, High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other Than Tops: Grade HGL (1.0 mm).
2. Postformed Surfaces: Grade HGP (1.0 mm).
3. Vertical Surfaces: Grade VGS (0.7 mm).
4. Edges: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.

F. Materials for Semi-exposed Surfaces:

1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.

    a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
    b. For semi-exposed backs of doors and other semi-exposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS and matching color of exposed surfaces.

2. Drawer Sides and Backs: Thermoset decorative panels with PVC edge banding, 1/2 inch minimum thickness.
3. Drawer Bottoms: Thermoset decorative panels, 1/2 inch minimum thickness.

G. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL. Backs shall be 1/2 inch minimum thickness and mechanically fastened to cabinet bodies.

H. Security Dust Panels: Provide 3/4-inch thick security dust panels above lockable drawers, unless located directly under tops.

I. Shelves: Shelves shall be adjustable and supported by shelf standards and clips.

1. Design loading: 50 psf.
2. Maximum Width: 48 inches for concealed shelves, 42 inches for exposed shelves.
3. Thickness: 1-inch minimum thickness.

J. Hinges: Doors 80 inches or more in height shall be provided with four (4) hinges.

K. Locks, Doors and Drawers:

1. Provide locks on drawers as indicated on plans.
2. Provide locks on cabinet doors as indicated on plans.

3. Lock and key alike all doors and drawers of all cabinets shown. Each room's cabinets shall be keyed separately. Provide four (4) keys each. Each set of keys shall be divided into two (2) sets (2 keys each), ringed and tagged with a typed label listing the corresponding room number (match posted sign) i.e "Cabinets-Room 130"

L. Marker board:

1. Horizontal sliding marker board shall be suspended from molded nylon rollers in a clear anodized aluminum track and frame.

a. Quality Standard: Claridge HS series or equal

1) Writing surface shall be 24 gauge porcelain on steel bonded to 3/8" particle board
2) Back board with foil backing
3) Size to fit cabinet opening
4) Track shall be one continuous piece

M. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As selected by Architect from laminate manufacturer's full range in the following categories:

a. Solid colors, matte finish.
b. Wood grains, matte finish.
c. Patterns, matte finish.

2.3 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with WI's "North American Architectural Woodwork Standards," latest edition, Section 11 "Countertops" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

1. Grade: Premium Grade.
2. Provide labels and certificates from the Woodwork Institute (WI) certification program indicating that woodwork, including installation, complies with requirements of grades specified.
3. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard indicated.

B. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS or HGP as required for post-formed counter tops.

C. Colors and Pattern: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As selected by Architect from manufacturer's full range in the following categories:

a. Solid colors, matte finish.

D. Edge Treatment: Same as laminate cladding on horizontal surfaces.

1. Splash: Integral cove splash with square top, 4 inches high unless otherwise indicated.
2. Front Edge: Waterfall Edge.

a. No-Drip Edge at countertops where sinks are installed.

E. Core Material: Particleboard, 3/4 inch thick; counter tops for sinks to be particleboard made with exterior glue.

F. Counter Top Edge Thickness: Build up counter top edge thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.

G. Backer Sheet: Provide paper backing on underside of countertop substrate.

H. Cutouts: Edges of cut outs shall be sealed per WI Custom Grade requirements with a color toned water resistant varnish before sink or rims are installed.

2.4 MATERIALS

A. General: Provide materials that comply with requirements of WI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Panel Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated. Provide products containing no urea formaldehyde complying with the following:

1. Hardboard: AHA A135.4.
2. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
3. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
4. Softwood Plywood: DOC PS 1, Medium Density Overlay.

C. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:

a. Wilsonart International; Div. of Premark International, Inc.
b. Formica Corporation.
c. Nevamar Company, LLC; Decorative Products Div.

2.5 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets and complying with ANSI/BHMA Grade 1 performance requirements.

B. Overlay Butt Hinges: 2-3/4-inch, 5-knuckle steel hinges made from 0.095-inch thick metal, with hospital tips; ANSI/BHMA 156.9, Grade 1.

1. Manufacturer/Product: Rockford Process Control (RCP) RP-376 or equivalent.

C. Wire Pulls: Back mounted, solid stainless steel or aluminum bent wire pulls, 4 inches long, 5/16 inch in diameter, 1-1/2 inch projection.

1. Doug Mockett and Company, Inc.; DP57B or equivalent.

D. Catches:

1. Magnetic Catches: Ives, No. 325, aluminum body, 5 lb maximum load.
2. Friction Catch: Bainbridge, FlexaCatch 2120.
3. Slide Bolt: Quality Hardware.

E. Drawer Suspension:

1. 100-pound rated ball bearing full extension drawer slides.

F. Shelf Standards:

1. LD 32 mm line boring system with 5 mm steel pins for shelving less than 36 inches wide.
2. KV255 with KV256 supports for shelving 36 inches wide and wider.
3. Provide seismic restraint pins in back row or notch shelf.

G. Cabinet Door and Drawer Locks: Olympus #200 (Doors) and Olympus #100 (Drawers). Finish to match other cabinet hardware.

1. Provide lock housings, cylinders, and strikes in cabinets designated to receive locks. Adjust locks and strikes to assure proper alignment and operations. Refer to Drawings for designated cabinets to receive locks.
2. The final keying and scheduling of all cabinet locks shall be coordinated with the Owner by the Architect or Construction Manager when applicable.

H. Grommets for Cable Passage through Countertops: Chromed Metal 1-3/4-inch diameter cord opening with slotted cap.

1. Product: Subject to compliance with requirements, provide "MM series" by Doug Mockett & Company, Inc.

I. Clothes Hanger Poles: Shall be chrome plated steel pipe or stainless steel tubing. 1” minimum diameter with matching receivers.

J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated.

1. Satin Chromium Plated: ANSI/BHMA 626 for brass or bronze base; ANSI/BHMA 652 for steel base.
2. Satin Stainless Steel: ANSI/BHMA 630.

K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.

2.6 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Adhesives containing no urea formaldehyde and as recommended by fabricator or manufacturer. Use clear types where glue lines will be exposed.

D. VOC Limits for Installation Adhesives and Sealants: Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Multipurpose Construction Adhesives: 70 g/L.
3. Structural Wood Member Adhesive: 140 g/L.
4. Architectural Sealants: 250 g/L.

2.7 FABRICATION

A. Interior Woodwork Grade: Comply with Woodwork Institute’s (WI) “North American Architectural Woodwork Standards” (NAAWS), latest edition, quality standards indicated.

B. Fabricate architectural cabinets to dimensions, profiles, and details indicated.

1. Accessible Casework: Comply with accessible regulatory requirements indicated in Part 2 Article “Performance Requirements.”

C. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

E. Adjustable Shelf Standards: Adjustable shelf standards shall be recessed into cabinet sides.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION OF CABINETS

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to walls as indicated on Drawings and in compliance with referenced seismic requirements.

F. Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

3.3 INSTALLATION OF COUNTER TOPS

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.

1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
2. Seal edges of cutouts by saturating with varnish.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

F. Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Where applied back splashes are used, secure backsplashes to tops with concealed metal brackets at 16 inches on center and to walls with adhesive.
3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces.

END OF SECTION

SECTION 064118
SOLID SURFACE COUNTER TOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Solid plastic surface counter tops and window sills Related Sections include but are not limited to the following:

2. Division 05 Section “Metal Fabrications” for fabricated metal support brackets.
3. Division 06 Section "Rough Carpentry" for blocking, shims, and sub-tops required for installing solid surface counter tops.
4. Division 06 Section “Plastic Laminate Casework” for plastic laminate counter tops.
5. Division 22 Sections as applicable to plumbing fixtures and trim.

1.3 SUBMITTALS

A. Product Data: For solid-surfacing material.

B. Shop Drawings: For countertops; show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
2. Show locations and sizes of blocking and/or backing including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for plumbing fixtures and other items.
4. Apply Woodwork Institute certified compliance label to first page of Shop Drawings.

C. Samples for Initial Selection: For each type of material exposed to view; submit manufacturer’s color charts or samples.

D. Samples for Verification: Solid-surfacing materials, 6 inches square.

E. Woodwork Quality Standard Compliance Certificates: WI-certified compliance certificates.

F. Qualification Data: For Installer and fabricator.

G. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate counter tops similar to those required for this Project and whose products have a record of successful in-service performance

B. Installer Qualifications: Fabricator of products.

C. Quality Standard: Unless otherwise indicated, comply with Woodwork Institute's (WI) "North American Architectural Woodwork Standards," (NAAWS) latest edition, for grades indicated for construction, installation, and other requirements.

1. Provide WI-certified compliance labels and certificates indicating that counter tops, including installation, complies with requirements of grades specified.
2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with such selections and requirements in addition to the quality standard.

D. Regulatory Requirements for Accessibility: Counter tops shall comply with the 2010 ADA Standards for Accessible Design and with the 2022 California Building Code, Chapter 11B, "Accessibility to Public Buildings, Public Accommodations, Commercial Buildings, and Public Housing." Accessible counter tops shall comply with the following:

1. Counter Top Heights: Not more than 34 inches above the floor surface; where self rimming sinks or lavatories are installed in counter tops, counter top height shall be such that the top rim of the sink is not more than 34 inches above the finished floor (CBC 11B-606.3 and 11B-902.3).
2. Knee Space: Vertical clearance of not less than 27 inches above the floor, minimum width of 30 inches, and minimum depth of 19 inches (CBC 11B-306).
3. Side Reach Depth: Where counter tops are accessible by a parallel wheelchair approach, the side reach depth over the counter top shall not exceed 24 inches measured from the front edge of the counter top to the finished face of the wall behind the counter top (11B-308.3.2).
4. Forward Reach Depth: Where counter tops are accessible by a forward wheelchair approach with knee and toe space below, the forward reach depth over the counter top shall not exceed 25 inches measured from the front edge of the counter top to the finished face of the wall behind the counter top (CBC 11B-308.2.2).

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver solid surface counter tops until painting and similar operations that could damage counter tops have been completed in installation areas. If counter tops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install solid surfacing materials until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 45 and 65 percent during the remainder of the construction period.

B. Field Measurements: Where work is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support counter tops by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, reinforcements, and other related units of Work specified in other Sections to ensure that interior solid surface counter tops can be supported and installed as indicated.

B. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTER TOP MATERIAL

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.

1. Basis of Design: Design, Drawings and Specifications are based on the following:

a. E. I. du Pont de Nemours and Company; Corian.

1) Subject to compliance with requirements, provide the specified product or equivalent products by one of the following:

a) Avonite, Inc.
b) Formica Corporation.
c) Wilsonart International; Div. of Premark International, Inc.

2. Solid-Surfacing-Material Thickness: 1/2 inch.
3. Colors, Patterns, and Finishes: As selected by Architect from manufacturer's full range.

    a. Each counter top shall be of a single color/pattern selection.
    b. Color/pattern selections shall include 1 color for the Project.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions and in compliance with Woodwork Institute's North American Architectural Woodwork Standards, latest edition, Section 11 "Counter Tops."

    1. Grade: Premium.

B. Fabricate tops in one piece with shop-applied edges and backsplash unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

    1. Front Edge:

        a. Countertops: Built-up edge, 1 inch high, shop applied.

            1) No-Drip Water Fall Edge at countertops where sinks are installed.

        b. Window Sills: As indicated on drawings.

    2. Backsplash: Shop-applied back splash complying with the following:

        a. Height: 4 inches.
        b. Style: Coved to counter top.
        c. Top Edge: Square.
        d. Side Splashes: Field applied square splash.

C. Holes and Cutouts:

    1. Holes: Drill holes in counter tops in shop for plumbing fittings, undercounter soap dispensers, and similar items.
    2. Undercounter Plumbing Fixtures: Make cutouts for fixtures using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.

D. Drill holes in countertops for plumbing fittings and accessories in shop.

2.3 MISCELLANEOUS MATERIALS

A. Plywood Sub-Tops: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded, and containing no urea formaldehyde.

B. Adhesives: Adhesives as recommended by solid surface manufacturer and containing no urea formaldehyde. Use clear types where glue lines will be exposed.

C. Silicone Sealant: Sealant as recommended by solid surface manufacturer, single-component, non-sag, neutral-curing silicone joint sealant, ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Color: Match counter top.

D. VOC Limits for Installation Adhesives and Sealants: Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Multipurpose Construction Adhesives: 70 g/L.
3. Structural Wood Member Adhesive: 140 g/L.
4. Architectural Sealants: 250 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before installation, condition counter tops to required environmental conditions specified for installation areas.

3.3 INSTALLATION

A. Install counter tops to comply with WI grade requirements specified in Part 2 for fabrication of type of counter tops involved.

B. Scribe and cut counter tops to fit adjoining work.

C. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.

D. Fasten sub-tops to cabinets by screwing through sub-tops into corner blocks of base cabinets. Shim as needed to align sub-tops in a level plane.

E. Secure countertops to sub-tops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

F. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

G. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

H. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

I. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

J. Apply sealant to gaps at walls; comply with Division 07 Section "Joint Sealants."

3.4 REPAIR

A. Repair damaged and defective work, where possible, to eliminate functional and visual defects; replace Work that cannot be repaired.

END OF SECTION

SECTION 066400
FIBERGLASS REINFORCED PLASTIC PANELING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes glass-fiber reinforced plastic (FRP) wall paneling and trim accessories.

B. Related Sections:

1. Division 09 Section “Gypsum Board.”

1.3 SUBMITTALS

A. Product Data: For each type of product indicated; include installation instructions; product data for panels, trim, and adhesive; and VOC content and chemical components for adhesives and sealants.

B. Samples for Initial Selection: For plastic paneling and trim accessories.

C. Samples for Verification: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 FIBERGLASS REINFORCED PLASTIC (FRP) SHEET PANELING

A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

B. Fiberglass Reinforced Plastic Panels: Plastic panels complying with ASTM D 3841 comprised of thermosetting styrenated and acrylated polyester resins reinforced with glass fibers.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kemlite Company Inc.
    b. Marlite.
    c. Nudo Products, Inc.

2. Nominal Thickness: Not less than 0.09 inch.
3. Surface Finish: Molded pebble texture.
4. Color: As selected by Architect from manufacturer's full range of not less than six colors.
5. Surface-Burning Characteristics: Class C as determined according to ASTM E 84 by UL or another acceptable qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 76-200.
    b. Smoke-Developed Index: 450 or less.

2.2 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.

1. Color: Match panels.

B. Adhesive: As recommended by plastic paneling manufacturer.

1. VOC Content: 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Sealant: Single-component, mildew-resistant, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Division 07 Section "Joint Sealants."

1. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove wall coverings, loose or soluble paint, and other materials that might interfere with adhesive bond.

B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

C. Clean substrates of substances that could impair bond of adhesive, including oil, grease, dirt, and dust.

D. Condition panels and trim by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels.

1. Mark plumb lines on substrate at trim accessory or panel joint locations for accurate installation.
2. Locate trim accessories and panel joints to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install panels at locations indicated with vertical edges plumb, top edges level and in alignment with other panels, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

1. Install panels vertically without horizontal joints unless distance is greater than the maximum available panel length. Where horizontal joints cannot be avoided, provide H-shaped trim between panels.

C. Install panels in a full spread of adhesive.

D. Install trim accessories with adhesive and nails; do not fasten through panels.

E. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.

F. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

G. Remove excess sealant and smears as panels are installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

3.4 CLEANING

A. Clean panel faces to remove soiling, stains, dust, and dirt using clean rags and cleaning agents as instructed by panel manufacturer.

END OF SECTION

SECTION 072116
BLANKET INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes:

1. Glass fiber batt/blanket insulation for thermal and acoustical insulation installed in framing cavities.

B. Related Sections:

1. Division 23 Sections as applicable to air distribution duct systems for insulation for ducts.

1.3 SUBMITTALS

A. Product Data: For each type of insulation and accessory.

B. Installer's Certification: Listing type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.

1. Sign, date, and post the certification in a conspicuous location on Project site.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

A. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:

1. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation.
2. Guardian Fiberglass, Inc.
3. Johns Manville.
4. Knauf Fiber Glass.
5. Owens-Corning.

C. Glass-Fiber Blanket Insulation, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

D. Glass-Fiber Blanket Insulation, Reinforced-Foil-Faced: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, or foil-scrim polyethylene vapor-retarder membrane on 1 face.

E. Thermal Resistance Values and Thicknesses: Where Drawings indicate thermal resistance values, provide units of the following nominal equivalent thicknesses:

1. R-13; 3-1/2 inch thickness.
2. R-19; 6 inch thickness.
3. R-25; 8 inch thickness.
4. R-30; 10 inch thickness.
5. R-38; 12 inch thickness.

2.2 ACCESSORY MATERIALS

A. Accessory materials shall be as recommended in writing by insulation manufacturer.

B. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.3 INSTALLATION

A. Install insulation in cavities formed by framing members in compliance with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation to provide a complete thermal envelope between the interior and exterior of the building and between conditioned and unconditioned interior spaces.

1. Provide insulation having thermal resistance values indicated on drawings, but not less than the following:

a. Walls: R-19.
b. Rafter Spaces and Ceilings: R-30.

2. Seal joints and fill gaps and voids in insulation using the following materials:

a. Spray Polyurethane Insulation: Seal joints and fill gaps, voids, and spaces around door and window frames with spray polyurethane insulation; apply according to manufacturer's written instructions.
b. Glass-Fiber Insulation: Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where it is not feasible to use spray polyurethane insulation; compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

C. Install insulation types according to the following:

1. Vapor-Retarder-Faced Blankets: Install vapor-retarder faced insulation at locations indicated below; install with vapor-retarder membrane to the climate conditioned side of framing.

a. Exterior Walls: Install vapor retarder faced insulation in stud wall cavities of exterior walls.
b. Interior Walls: Install vapor retarder faced insulation in stud wall cavities of interior walls between conditioned and unconditioned spaces.

c. Rafters: Install vapor retarder faced insulation in framing cavities between rafters.

2. Unfaced Blankets: Install in the following locations:

a. Interior Walls: Stud wall cavities of interior walls between conditioned interior spaces for acoustical insulation at locations indicated on the Drawings, thickness of insulation to match stud width.
b. Ceilings:

1) Thermal Applications: Install unfaced insulation over gypsum board ceilings having an unconditioned vented attic space above.
2) Acoustical Applications: Install unfaced insulation over ceilings at locations indicated on Drawings.

D. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

E. Install vapor barrier faced thermal insulation with manufacturer's R-value label exposed after insulation is installed.

F. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

G. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

H. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

I. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

J. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

K. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.

L. For wood-framed construction, install blankets according to ASTM C 1320 using faced blankets having stapling flanges; lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

M. Vapor Retarder Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

N. Water-Piping in Walls: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

O. Use mechanical anchorage to provide permanent placement and support of units.

3.4 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, moisture, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 072500
WEATHER RESISTIVE BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Building wrap.
2. Flexible flashing.

B. Related Sections include but are not limited to the following:

1. Division 06 Section “Plywood Panel Sheathing” for exterior wood panel sheathing.
2. Division 07 Section “Sheet Metal Flashing and Trim.”
3. Division 08 Sections as applicable to doors, windows, and similar wall openings.
4. Division 09 Section “Portland Cement Plastering.”

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include data on air and moisture infiltration protection based on testing according to referenced standards.

B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Building wrap membrane.

C. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing weather resistive barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain each type of product through one source from a single manufacturer.

C. Mockups: Before beginning installation, build mockup of weather resistive barrier assembly as directed by Architect, incorporate surface preparation, crack and joint treatment, sealing of gaps and terminations, and penetration flashing for window and door frames.

1. Approved mockups may become part of the completed Work if undisturbed and undamaged.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials in their original undamaged packages in a clean, dry, protected location and in accordance with manufacturer's written recommendations.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Install weather resistive barrier materials within the range of ambient and substrate temperatures recommended by manufacturer. Protect substrates from environmental conditions that affect performance of weather resistive barrier system. Do not apply weather resistive barrier materials to damp or wet substrates or during snow, rain, fog, or mist.

1.7 COORDINATION

A. Coordinate the sequence of installation of weather resistive barrier materials with the installation of exterior wall sheathing and wall finish materials in order to minimize the exposure of sheathing and weather resistive barrier materials to moisture, wind, and sunlight.

PART 2 - PRODUCTS

2.1 BUILDING WRAP

A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. DuPont (E. I. du Pont de Nemours and Company); Tyvek CommercialWrap.

2. Performance Characteristics:

a. Air Penetration: 0.001 cfm/ft^2 at 75 Pa, when tested in accordance with ASTM E2178. Type I per ASTM E1677. ≤0.04 cfm/ft^2 at 75 Pa, when tested in accordance with ASTM E2357.

b. Water Vapor Transmission: 28 perms, when tested in accordance with ASTM E96, Method B.
c. Water Penetration Resistance: Minimum 280 cm when tested in accordance with AATCC Test Method 127.
d. Basis Weight: Minimum 2.7 oz/yd^2, when tested in accordance with TAPPI Test Method T-410.
e. Air Resistance: Air infiltration at >1500 seconds, when tested in accordance with TAPPI Test Method T-460.
f. Tensile Strength: Minimum 38/35 lbs/in., when tested in accordance with ASTM D882, Method A.
g. Tear Resistance: 12/10 lbs., when tested in accordance with ASTM D1117.
h. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 10, Smoke Developed: 10.
i. Allowable UV Exposure Time: Not less than three months.

2.2 FLEXIBLE FLASHING

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. DuPont (E. I. du Pont de Nemours and Company).

1) DuPont Flex-Wrap (70 mil), use at door and window heads and sills.
2) DuPont Straight-Flash (30 mil), use at door and window jambs.

2.3 SEALING TAPE AND FASTENERS

A. Sealing Tape: Pressure-sensitive plastic tape recommended by building wrap manufacturer for sealing joints and penetrations in building wrap, 4 inch minimum width tape.

B. Screws for Fastening Membrane to Steel Framing: Manufacturer’s standard corrosion resistant screws with 2-inch diameter plastic washers and of length required to penetrate not less than 1-inch into framing.

2.4 MISCELLANEOUS MATERIALS

A. Primers: Primers as recommended in writing by weather resistive barrier material manufacturer.

B. Sealants: Sealants as recommended in writing by weather resistive barrier material manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for weather resistive barrier material application.

B. Treat fins, ridges, other projections, and changes in substrate plane to provide a smooth transition and eliminate sharp projections or edges between surfaces.

3.3 INSTALLATION, GENERAL

A. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

B. Coordinate installation of building wrap with installation of flexible flashing.

C. Coordinate installation of weather resistive barrier materials with installation of wall sheathing and subsequent application/installation of exterior wall finish materials.

3.4 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing at exterior door, window, and similar openings to comply with manufacturers written instructions.

1. Prime substrates as recommended by flashing manufacturer.
2. Lap seams and junctures with other materials at least 4 inches, except that at flashing flanges of other construction, laps need not exceed flange width.
3. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

B. Begin installation of flexible flashing at sills of openings, lap jamb flashing over sill flashing, lap head flashing over jamb flashing.

1. Fasten sill flashing at top edge only to allow for subsequent installation of building wrap membrane behind sill flashing.

3.5 BUILDING WRAP MEMBRANE INSTALLATION

A. General: Install building wrap over exterior side of wall sheathing in accordance with manufacturer's written instructions and as follows.

1. Begin installation of the building wrap at the bottom of the wall, run building wrap horizontally and set level. Install subsequent layers over previous layers lapping horizontal joints not less than 2 inches in shingle fashion for drainage.
2. Overlap building wrap at corners of building by a minimum of 12 inches.
3. Overlap building wrap at vertical seams by a minimum of 6 inches.
4. Seal seams, edges, fasteners, tears, and penetrations with tape.
5. Install building wrap behind flexible sill flashing lapped in shingle fashion to shed water.
6. Extend over jambs of openings and seal corners with tape.
7. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion or control-joint locations.
8. Apply barrier to cover vertical flashing with a minimum 4-inch overlap, unless otherwise indicated.
9. Secure building wrap with screws with washers screwed through exterior sheathing and into stud framing. Space fasteners as recommended in writing by building wrap manufacturer.

3.6 PROTECTION

A. Protect weather resistive barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions, until subsequent finishes are applied.

1. Protect weather resistive barrier materials from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace weather resistive barrier materials exposed to these conditions for more than 30 days.

END OF SECTION

SECTION 072616
UNDERSLAB VAPOR RETARDER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Under slab vapor retarder for concrete slabs on grade.

B. Related Sections include but are not limited to the following:

1. Division 01 Section “Photographic Documentation.”
2. Division 03 Section "Cast-in-Place Concrete."
3. Division 31 Section "Earthwork."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include manufacturer’s specifications and installation instructions.

B. Testing Documentation: Third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1.

C. Samples: For vapor retarder membrane.

D. Digital Photography: Digital photographs of completed installation including seam and penetration sealing, terminations at foundations, and repairs.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Use an experienced installer and adequate number of skilled personnel who are thoroughly trained and experienced in the application of the vapor retarder.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1. Review procedures for field quality control, vapor-barrier installation, steel reinforcement installation, repair procedures, and protection.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened packaging, with labels identifying manufacturer and product.

B. Store materials in accordance with manufacturer's written instructions and to prevent damage.

C. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

A. Do not apply material during rain or during windy conditions.

B. Do not apply on frozen ground.

1.7 COORDINATION

A. Coordinate installation of vapor retarder, reinforcing steel, and placement of concrete to minimize tears and punctures, and to minimize exposure of vapor retarder to sunlight.

PART 2 - PRODUCTS

2.1 VAPOR RETARDERS

A. Plastic Vapor Retarder: Single ply membrane extruded from virgin grade high-impact polyolefin complying with ASTM E 1745, Class A.

1. Available Products: Subject to compliance with requirements, provide one of the following products:

    a. Raven Industries Inc.; Vapor Block 15.
    b. Stego Industries, LLC; Stego Wrap 15 mil.
    c. W.R. Meadows, Inc., Perminator 15.

2. Thickness: 15 mils.
3. Roll Width: 12 feet minimum.
4. Maximum Permeance: One of the following: ASTM E1745 Section 7.1 (7.1.1-7.1.5), permeance of less than 0.01 Perms (grains/(ft^2 · hr · inHg)) after conditioning.

5. Puncture Resistance: ASTM D1709, Method B, not less than 2,266 Grams.

2.2 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by manufacturer for intended use and compatible with vapor retarder.

B. Seam Tape: High Density Polyethylene Tape with pressure sensitive adhesive as manufactured or recommended by vapor retarder manufacturer, minimum width 4 inches.

C. Pipe Boots: Construct pipe boots from vapor retarder material and pressure sensitive tape per manufacturer’s written installation instructions.

D. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions with Installer present for compliance with requirements for conditions affecting performance of the Work.

B. Proceed with installation of vapor retarder only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Level and tamp or roll granular base as specified in Division 31 Section “Earthwork.”

3.3 INSTALLATION OF VAPOR RETARDER

A. Vapor Retarders: Place, protect, and repair vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Vapor retarder to be installed over prepared, finely graded subgrade.

B. Unroll vapor retarder and install with the longest dimension parallel with the direction of the pour. Open all folds to the full width.

C. Lap joints 6 inches and seal with manufacturer's recommended tape.

D. Seal holes, openings, and pipe and conduit penetrations in vapor retarder. Fabricate boots around pipes and conduits in accordance with manufacturer’s written installation instructions and seal with tape.

E. Areas of adhesion for taped seams, penetrations, and repairs shall be free of dust, dirt, moisture, or other conditions affecting the performance of the tape seal.

F. Terminate vapor retarder at vertical foundation walls by turning up 4 inches against the wall and sealing with tape or fastening with concrete nails spaced 4 feet on center. Where vertical foundation walls do not occur, extend vapor retarder not less than 12 inches into footing trench prior to pouring footings.

G. Place 2 inches of dry sand over properly installed and inspected vapor retarder. Protect from rain and moisture; remove sand that is saturated or dampened prior to concrete placement.

H. Coordinate installation of vapor retarder with Work Division 3 Section “Cast-in-Place Concrete.”

1. Use only brick type reinforcing bar supports for reinforcing steel.
2. Avoid driving stakes through vapor retarder membrane, repair all holes.
3. Provide for protection of vapor retarder membrane in high traffic areas.

3.4 FIELD QUALITY CONTROL

A. Immediately after the installation of the vapor retarder, the Contractor, in the presence of the Owner’s Inspector or representative, shall review the completed installation and document the installation using digital photography. Documentation shall include the completed installation, seams, penetrations, terminations, and repairs.

B. After installation of reinforcing steel and just prior to pouring of concrete, the Contractor, in the presence of the Owner’s Inspector or representative, shall review the installed vapor retarder for tears or damage.

C. Inspection reports shall be submitted to the Architect and the Contractor.

3.5 REPAIRS

A. Repair tears and punctures with a vapor retarder patch that overlaps the damaged area by 6 inches in all directions, seal perimeter of the patch with tape.

3.6 PROTECTION

A. Protect installed vapor retarders from damage due to UV light, harmful weather exposures, physical abuse, and other causes until concealed by permanent construction.

B. Remove rain or water from retarder prior to concrete placement by air blowers.

END OF SECTION

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Manufactured Sheet Metal Flashing Products:

a. Manufactured reglets and counter flashing.

2. Formed sheet metal fabrications:

a. Flashing and trim.
b. Miscellaneous sheet metal fabrications.

B. Related Sections include the following:

1. Division 06 Section “Rough Carpentry” for wood nailers, curbs, and blocking.
2. Division 07 Sections as applicable to metal roof panels for sheet metal flashing and trim integral with metal roof systems.
3. Division 07 Sections as applicable to roofing for sheet metal flashing and trim integral with roofing systems.
4. Division 07 Section "Joint Sealants" for field-applied sheet metal flashing and trim sealants.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For fabricated sheet metal items. Show fabrication and installation layouts including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop and field-assembled work. Include the following:

1. Identification of material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Details of termination points and assemblies, including fixed points.
5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
7. Details of special conditions.
8. Details of connections to adjoining work.
9. Detail formed flashing and trim at a scale of not less than 3 inches per 12 inches.

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish; submit 12 inch long sample of fabricated unit including finished seam, fasteners, cleats, clips, closures, and other attachments.

E. Sample Warranty: For special warranty.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Entity that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of typical roof edge, eave, fascia, fascia trim, apron flashing, approximately 10 feet long, including supporting construction cleats, seams, attachments, and accessories.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim.
2. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
4. Review requirements for insurance and certificates if applicable.
5. Review sheet metal flashing observation and repair procedures after flashing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.8 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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 Roofing and Waterproofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements as applicable for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Sheet metal flashing and trim shall allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. As-Milled Finish: Mill finish.
2. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
3. Aluminum sheet shall be used where sheet metal flashing and trim is installed adjacent to aluminum-framed storefronts.

C. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A 755/A 755M as indicated below.

1. Surface: Smooth, flat and mill phosphatized for field painting.

2. Coil-Coated Finish:
   a. Exposed Coil-Coated Finish: Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

      1) Color: As selected by Architect from manufacturer's full range.
      2) Coil-Coated Finish shall be used where sheet metal flashing and trim is installed adjacent to standing seam metal roof system.

   b. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

A. Polyethylene Sheet: 6-mil thick polyethylene sheet complying with ASTM D 4397.

B. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

C. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
3. Products: Subject to compliance with requirements, provide one of the following:

   a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
   b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
   c. Henry Company; Blueskin PE200 HT.
   d. Metal-Fab Manufacturing, LLC; MetShield.
   e. Owens Corning; WeatherLock Metal High Temperature Underlayment.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. Self-drilling screws, gasketed, with hex-washer head.

2. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
3. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
4. Fasteners for Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.

C. Solder for Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane, polysulfide, or silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and welded corners and junctions.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Fry Reglet Corporation.
    b. Heckmann Building Products Inc.
    c. Hickman, W. P. Company.

2. Material: Galvanized steel, 0.0217 inch thick.
3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers and with channel for sealant at top edge.
4. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.

5. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
6. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
7. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

2.6 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim as indicated on Drawings and to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

E. Fabricate cleats and attachment devices from same material as accessory being anchored and of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.

F. Seams: Fabricate nonmoving seams with flat-lock seams and as follows:

1. Seams for Pre-Finished Metal: Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
2. Seams for Unfinished Sheet Steel: Tin edges to be seamed, form seams, and solder.

3. Seams for Unfinished Aluminum: Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

G. Do not use graphite pencils to mark metal surfaces.

H. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

2.7 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

A. Apron, Step, Cricket, and Backer Flashing: Fabricate from 0.028 inch (24 gage) thick galvanized steel.

B. Drip Edges: Fabricate from 0.028 inch (24 gage) thick galvanized steel.

C. Eave, Rake Flashing: Fabricate from 0.028 inch (24 gage) thick galvanized steel.

D. Base Flashing: Fabricate from 0.028 inch (24 gage) thick galvanized steel.

E. Roof-Penetration Flashing: Fabricate from 0.028 inch (24 gage) thick galvanized steel.

2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Miscellaneous Sheet Metal Fabrications: Fabricate from 0.028 inch (24 gage) thick galvanized steel unless otherwise indicated.

2.9 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Polyethylene Sheet: Install polyethylene sheet with adhesive for anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches.

B. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
5. Install sealant tape where indicated.

6. Torch cutting of sheet metal flashing and trim is not permitted.
7. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

1. Coat back side of uncoated aluminum sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corners or intersections. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Fastener Sizes:

1. Wood Framing, Blocking, and Sheathing: Use fasteners of sizes that will penetrate [wood sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
2. Metal Framing, Backing, and Decking: Use fasteners of sizes that will penetrate metal framing, backing, and decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints as shown and as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder coil-coated steel and aluminum sheet.
2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

G. Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, SMACNA's "Architectural Sheet Metal Manual," and NRCA's Roofing and Waterproofing Manuals as applicable to project conditions Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to referenced requirements and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at 16 inch centers.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of interlocking folded seam or blind rivets and sealant or anchor and washer at 36-inch centers.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Reglets and Counterflashing: Install in accordance with manufacturer's written installation instructions.

C. Openings Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings, unless shown otherwise on the drawings.

3.6 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 079200
JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants including mildew resistant silicone joint sealants
2. Urethane joint sealants.
3. Latex joint sealants.
4. Joint sealant Backings

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product, include documentation for VOC content of sealants and sealant primers.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

E. Field-Adhesion Test Reports: For each sealant application tested.

F. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity employing installers trained and experienced in installing joint sealants similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance.

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

C. Preinstallation Conference: Conduct conference at Project site.

1.5 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.6 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties shall warrant that all exposed sealants will be guaranteed against any crazing developing on the surfaces of the material, any staining of adjacent surfaces by sealant or by primer (yellowing, etc.), chalking, or color changes on surface of cured sealant.

D. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content: Sealants and primers applied at the Project site shall comply with VOC limits of authorities having jurisdiction; VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); and VOC limits of the California Green Building Standards Code (CGBSC), Section 5.504.4.1 and Table 504.4.2 as follows:

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

D. Stain-Test-Response Characteristics: Where sealants are indicated to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Contact with Food: Where sealants are used in areas of food preparation, use products that comply with 21 CFR 177.2600 and are USDA approved.

F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

G. Source Limitations: Obtain each kind of joint sealant from a single source from a single manufacturer.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, non-traffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT. neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 790.
b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
c. Tremco Incorporated; Spectrem 1.

2. Joint Sealant Application: Exterior joints where one or both joint faces are masonry, stone, concrete or other porous materials and are not to be painted.

B. Silicone, Acid Curing, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant: ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 999-A.
b. GE Advanced Materials - Silicones; Contractors SCS1000.
c. Tremco Incorporated; Proglaze.

2. Joint Sealant Application: Exterior joints where both joint faces are metal, glass, plastic, or other non-porous material and are not to be painted.

C. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT; formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 786 Mildew Resistant.
b. GE Advanced Materials - Silicones; Sanitary SCS1700.
c. Tremco Incorporated; Tremsil 200 Sanitary.

2. Joint Sealant Application: Interior joints between plumbing fixtures and floor or wall surfaces of non-porous materials and are not to be painted.

2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. BASF Building Systems; Sonolastic NP1.
    b. Pecora Corporation; Dynatrol I-XL.
    c. Sika Corporation, Construction Products Division; Sikaflex - 1a.

2. Joint Sealant Application: Exterior joints of hollow metal frames, exterior joints in concrete and masonry walls, and interior and exterior joints requiring painting.

B. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. BASF Building Systems; Sonolastic SL 1.
    b. Pecora Corporation; Urexpan NR-201.
    c. Sika Corporation. Construction Products Division; Sikaflex - 1CSL.

2. Joint Sealant Application: Interior concrete slab floor joints and exterior paving joints.

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. BASF Building Systems; Sonolac.
    b. Pecora Corporation; AC-20+.
    c. Tremco Incorporated; Tremflex 834.

2. Joint Sealant Application: Interior non-moving joints between gypsum board and adjacent materials, trim, or similar surfaces.

2.5 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) or Type B (bicellular material with a surface skin), as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
    d. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Etch concrete and masonry joint surfaces as recommended by manufacturer to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance. Etch with 5% solution of muriatic acid; neutralize with diluted ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.

C. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

D. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

    1. Do not leave gaps between ends of sealant backings.

2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Install sealant to depths as shown or, if not shown, as recommended by sealant manufacturer but within the following general limitations, measured at center (thin) section of bead:

1. For sidewalks, pavements and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75 percent of joint width, but neither more than 5/8 inch deep nor less than 3/8 inch deep.
2. For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50 percent of joint width, but neither more than 1/2 inch deep nor less than 1/4 inch deep.
3. For joints sealed with non-elastomeric sealants and caulking compounds, fill joints to a depth in range of 75 to 125 percent of joint width.

G. Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces.

H. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. General: Provide field adhesion testing when required by manufacturer and/or installer for warranties required of manufacturer and/or installer.

B. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

    a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
    b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

    a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

    a. Whether sealants filled joint cavities and are free of voids.
    b. Whether sealant dimensions and configurations comply with specified requirements.
    c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

C. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 081053
DOOR LITE FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:

1. Door lite frames for wood and FRP-aluminum hybrid doors.

B. Related Sections:

1. Division 08 Sections "Flush Wood Doors" for wood doors.
2. Division 08 Sections “FRP-Aluminum Hybrid Doors” for FRP-aluminum hybrid doors.
3. Division 08 Section "Glazing" for glass installed in door lite frames.
4. Division 09 Sections “Painting” for field painting door lite frames.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, and finishes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain door lite frames and door louvers from a single source from a single manufacturer.

B. Basis of Design Manufacturer: In other Part 2 Articles where products are identified by Basis of Design named manufacturer and product, products are based on items manufactured by:

a. Anemostat Door Products.

1) Subject to compliance with requirements, provide products indicated, or comparable products by one of the following:

a) Activar Construction Products Group.
b) Alternate manufacturer subject to request for substitution.

2.2 DOOR LITE FRAMES

A. Metal Frames for Light Openings in Doors: Manufacturer's standard frame formed of steel sheet; factory primed for field finishing.

1. Basis of Design: Anemostat Door Products, LoPro or LoPro-IS Series as required for glass thickness specified.

2. Physical Characteristics:

a. Frame Material: 0.033 inch thick (20 gage) steel of material as follows:

1) Interior Door Lite Frames: Cold rolled steel of thickness indicated.
2) Exterior Door Lite Frames: Hot dipped galvanized of thickness indicated.

b. Size: As indicated on Drawings.
c. Glazing Thickness: As indicated on Drawings.
d. Finish: Baked enamel.
e. Fasteners: Oval head Phillips wood or sheet metal screws.

1) Provide one-way vandal resistant oval head wood or sheet metal screws at exterior doors.

2.3 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 zinc-iron-alloy coating designation.

D. Glazing: Comply with requirements in Division 8 Section "Glazing."

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install door lite frames in accordance with manufacturer's written instructions.

B. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with manufacturer's written instructions.

END OF SECTION

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:

1. Hollow-metal frames.
2. Hollow-metal doors.

B. Related Sections:

1. Division 08 Section “Door Louver and Light Frames” for door light frames.
2. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
3. Division 08 Section "Door Hardware" for testing of fire rated door installations egress doors with panic hardware and/or electrified hardware.
4. Division 08 Section "Glazing" for glass installed in hollow metal doors and frames.
5. Division 09 Sections “Painting” for field painting hollow metal doors and frames.
6. Division 26 Sections as applicable for electrical connections including conduit and wiring for door controls and operators.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.

6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work vertically under cover at Project site with head up. Place on minimum 4 inch high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating steel frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate installation of anchorages for standard steel frames. 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. Deliver such items to Project site in time for installation.

B. Coordinate requirements for preparation and installation of electrified door hardware and access control and security systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amweld Building Products, LLC.
2. Ceco Door Products; an Assa Abloy Group company.
3. Curries Company; an Assa Abloy Group company.
4. Deansteel Manufacturing Company, Inc.
5. Metal Products Incorporated (MPI).
6. Steelcraft; an Ingersoll-Rand company.
7. Windsor Republic Doors.

B. Source Limitations: Obtain hollow metal work from a single source from a single manufacturer.

2.2 REGULATORY REQUIREMENTS

2.3 HOLLOW METAL DOORS

A. General: Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

1. Type/Design: Flush panel unless otherwise indicated on the Drawings.
2. Door Thickness: 1-3/4 inches unless otherwise indicated.
3. Vertical Edges for Single-Acting Doors: Beveled, 1/8 inch in 2 inches.
4. Openings: Factory cut openings in doors.
5. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
6. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.
7. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
8. Exposed Finish: Factory prime finish for field painting.

B. Exterior Doors: Doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level.

1. Extra Heavy Duty Doors, Level 3 and Physical Performance Level A.
2. Face Sheet Material: Fabricated from metallic-coated steel sheet, 0.053-inch minimum thickness (16 gage).
3. Core Construction: One of the following:

    a. Manufacturer's standard polyurethane, or polyisocyanurate core.
    b. Manufacturer’s standard as required to comply with fire-protection and temperature-rise ratings indicated.

4. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints in top edges of doors against water penetration.

5. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.

C. Interior Doors: Doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level.

1. Heavy Duty Doors, Level 2 and Physical Performance Level B.
2. Face Sheet Material: Fabricated from cold-rolled steel sheet, 0.042-inch minimum thickness (18 gage).
3. Core Construction: One of the following:

a. Manufacturer's standard polyurethane, or polyisocyanurate core.
b. Kraft paper honeycomb core; one inch cell, phenolic resin impregnated core, laminated to face sheets, full area.
c. Manufacturer’s standard as required to comply with fire-protection and temperature-rise ratings indicated.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI A250.8 and with details indicated for type and profile.

1. Fabricate frames with mitered or coped full profile welded corners unless otherwise indicated.
2. Frames shall be sized to provide full throat width equal to depth of wall including finishes plus 1/2 inch backbend on each side per SDI-100.

B. Exterior Frames: Metallic-coated steel sheet, minimum thickness of 0.053 inch (16-gage).

C. Interior Frames: Cold-rolled steel sheet, minimum thickness of 0.053-inch (16 gage).

D. Exposed Finish: Factory prime finish for field painting.

E. Hardware Reinforcement: Fabricate with reinforcement plates from same material as frames with minimum reinforcement according to ANSI/SDI A250.6 and the following:

1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
3. Lock Face, Closers, and Concealed Holders: Minimum 0.067 inch thick.
4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

F. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.

G. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

H. Plaster Guards: Formed from same material as frames, not less than 0.016-inch thick.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
3. Postinstalled Expansion Anchor: Minimum 3/8-inch diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor; form from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

C. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.6 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (20 gage) thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with standard steel frames, minimum 5/8 inch high, unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.7 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 zinc-iron-alloy coating designation.

1. Material indicated to be fabricated from metallic coated steel sheet shall be of galvannealed steel sheet.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

F. Glazing: Comply with requirements in Division 8 Section "Glazing."

G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.8 FABRICATION

A. General: Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight and/or Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
3. Fabricate exterior frames with an additional flashing flange at the exterior side of frames as indicated on the Drawings.
4. Provide countersunk, flat or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
5. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
6. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

    a. For conditions that do not allow for a floor anchor, provide an additional jamb anchor.

7. Jamb Anchors: Provide number and spacing of anchors as follows unless additional anchors are required for fire rating:

a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Three anchors per jamb up to 60 inches high.
2) Four anchors per jamb from 60 to 90 inches high.
3) Five anchors per jamb from 90 to 96 inches high.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
5) Two anchors per head for frames 42 inches or more in width and mounted in metal-stud framed partitions.

b. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

8. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

9. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

D. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
2. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive non-templated mortised and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.

a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
b. Install frames with removable stops located on secure side of opening.

2. Fire-Rated Openings: Install frames according to NFPA 80.
3. Floor Anchors: Secure with postinstalled expansion anchors.
4. Insulation: Solidly pack mineral-fiber insulation inside frames that are not to be grouted.
5. Installation Tolerances: Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances. Adjust

hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below.

1. Non-Fire-Rated Doors: Comply with ANSI/SDI A250.8 as follows:

a. Between Door and Frame at Jambs and Head: 1/8 inch plus or minus 1/32 inch.
b. Between Edges of Pairs of Doors: 1/8 inch minimum, 1/4 inch maximum.
c. At Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
e. Between Door Face and Stop: 1/16 inch minimum, 1/8 inch maximum.

D. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat or oval-head machine screws spaced uniformly not more than 9 inches on center and not more than 2 inches on center from each corner.

3.4 ADJUSTING AND REPAIR

A. Final Adjustments: Final adjustment as specified in Division 08 Section “Door Hardware.”

B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

C. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 081416
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Solid-core flush wood veneer doors for transparent finish.
2. Factory finishing of solid core doors.

B. Related Sections:

1. Division 08 Section “Door Lite Frames” for lite frames for wood doors.
2. Division 08 Section “Hollow Metal Frames” for door frames for wood doors.
3. Division 08 Section “Door Hardware” for door hardware for wood doors.

1.3 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction and trim for openings.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of cutouts.

C. Schedule: Provide a schedule prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

D. Samples for Initial Selection: For factory-finished doors.

E. Warranty: Sample of special warranty.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons. Wrap bundles of doors in plastic sheeting for doors packaged in cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period. Comply with manufacturer's published recommendations.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to the following:

    a. Delamination of veneer.
    b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
    c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Algoma Hardwoods Inc.
2. Chappell Door Co.
3. Eggers Industries; Architectural Door Division.
4. Marshfield Door Systems, Inc
5. VT Industries Inc.

B. Source Limitations: Obtain flush wood doors from one source from a single manufacturer.

2.2 SOLID CORE VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. General Description: Interior, solid core, five-ply flush wood veneer faced doors for transparent finish.

B. Quality Standard: In addition to requirements specified, comply with ANSI/WDMA I.S. 1A.

C. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

D. Interior Solid-Core Doors:

1. Performance Grade: ANSI/WDMA I.S. 1A Heavy Duty.
2. ANSI/WDMA I.S. 1A Grade: Custom.
3. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.
4. Faces: Single-ply wood veneer not less than 1/50 inch thick.

    a. Species: Maple.
    b. Cut: Rotary cut.
    c. Match between Veneer Leaves: Book match.
    d. Assembly of Veneer Leaves on Door Faces: Running match.
    e. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.

5. Exposed Vertical and Top Edges: Applied wood edges of same species as faces and covering edges of crossbands.

6. Cores: Provide Cores for doors as follows:

    a. Material:

        1) Particleboard core doors unless otherwise indicated.
        2) Structural-composite-lumber cores in lieu of particleboard cores for doors indicated to receive exit devices as indicated on the Drawings and scheduled in Division 08 Section “Door Hardware.”

    b. Particleboard Core Doors: Particleboard, ANSI A208.1, Grade LD-2 unless otherwise indicated and made with binder containing no urea-formaldehyde resin.

        1) Blocking for Particleboard Doors: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware and as follows:

            a) 5-inch top-rail blocking, in doors indicated to have closers.
            b) 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.

c. Structural Composite Lumber Cores: WDMA I.S. 10 structural-composite-lumber cores containing no urea-formaldehyde resin.

1) Screw Withdrawal, Door Face: 475 lbf.
2) Screw Withdrawal, Vertical Door Edge: 475 lbf.

2.3 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.

C. Openings: Factory cut and trim openings through doors.

1. Vision Panels: Openings in doors for vision panels or other glazing shall be such that the bottom edge of visible glass shall be not more than 43 inches above the finished floor surface (Ref. CBC 11B-404.2.11).

2.4 FACTORY FINISHING, TRANSPARAENT FINISHED DOORS

A. General: Factory finish doors for transparent finish; comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises.
2. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Transparent Finish:

1. ANSI/WDMA I.S. 1A Grade: Custom.
2. Finish: ANSI/WDMA I.S. 1A TR-4 conversion varnish or TR-6 catalyzed polyurethane.
3. Staining: As selected by Architect from manufacturer's full range.
4. Effect: Semi-filled finish, produced by applying an additional finish coat to partially fill the wood pores.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For hardware and hardware installation, refer to Division 08 Section "Door Hardware."

B. Installation: Install doors to comply with manufacturer's written installation instructions, referenced quality standards, and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Re-hang or replace doors that do not swing or operate freely.

B. Factory Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 083113
ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes:

1. Access doors and frames for walls and ceilings.

B. Related Sections include the following:

1. Division 22 and 23 Sections as applicable for access to Plumbing and Mechanical valves and equipment behind finished surfaces.
2. Division 26 Sections as applicable for access to Electrical equipment behind finished surfaces.

1.3 SUBMITTALS

A. Product Data: For each type of access door and frame indicated. Include construction details, materials, individual components and profiles, and finishes.

B. Access Door and Frame Schedule: Provide access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.4 COORDINATION

A. Coordinate locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work with mechanical and plumbing trades.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Babcock-Davis.

2. Dur-Red Products.
3. J. L. Industries, Inc.
4. Karp Associates, Inc.
5. Larsen's Manufacturing Company.
6. Milcor Inc.
7. Nystrom, Inc.

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Non-Fire Resistance Rated Flush Access Doors and Frames with Exposed Trim: Access doors with face of door flush with frame, with exposed flange and concealed hinge.

1. Material:

a. Uncoated or Metallic Coated Steel Sheet:

1) Locations: Non-fire resistance rated wall and ceiling surfaces of painted gypsum board.
2) Doors: Nominal 0.060 inch (uncoated) or 0.064 inch (coated) (16 gage) thickness.
3) Frames: Nominal 0.060 inch (uncoated) or 0.064 inch (coated) (16 gage) thickness.
4) Finish: Factory prime finish, manufacturer’s standard baked on rust inhibitive gray primer.

b. Stainless Steel Sheet:

1) Locations: Non-fire resistance rated wall and ceiling surfaces with ceramic tile finish or prefinished wall paneling.
2) Doors: Nominal 0.062 inch (16 gage) thickness.
3) Frames: Same material and thickness as doors.
4) Finish: No. 4.

2. Hinges: Manufacturer’s standard concealed spring pin hinge.
3. Latch/Lock:

a. Latch: Cam latch operated by screwdriver with interior release.

1) Provide where access doors are located in private or semi-private areas such as office spaces, storage rooms, equipment rooms, and private toilet rooms.

b. Lock: Manufacturer’s standard key operated cylinder cam lock. Furnish two keys per lock and key all locks alike.

1) Provide where access doors are located in public areas such as exterior walls and ceilings, and public toilet rooms.

4. Size: As indicated on drawings or as required to provide access to valves and equipment concealed behind finished surfaces.

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines or blend into finish.

1. Finish: Directional satin finish, No. 4.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Size: As indicated on Drawings or size as required for access to concealed spaces, valves, or equipment.

1. Access to attic spaces shall not be less than 22 x 30 inches clear opening.
2. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

C. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

D. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
2. Provide mounting holes in frames for attachment of units to metal or wood framing, mounting holes shall not be located in exposed surfaces of frames.

E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:

1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
2. Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of 1 mil for topcoat.

E. Stainless-Steel Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

a. Run grain of directional finishes with long dimension of each piece.
b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
c. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 087100
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:

1. Commercial door hardware for swinging doors.
2. Testing of egress doors with panic hardware and fire rated door assemblies as required by NFPA 101.

B. Related Sections include but are not limited to the following:

1. Division 08 Section "Hollow Metal Doors and Frames."
2. Division 08 Section “Flush Wood Doors.”

1.3 REFERENCES AND ABBREVIATIONS

A. Industry standard references and abbreviations shall be as follows:

1. ADA: Americans with Disabilities Act (ADA), 2010 ADA Standards for Accessible Design.
2. BHMA: Builders' Hardware Manufacturers Association.
3. CCR: California Code of Regulations, Title 24, Part 2, California Building Code.
4. DHI: Door and Hardware Institute.
5. NFPA: National Fire Protection Association.

a. NFPA 101: Life Safety Code.

6. UL - Underwriters Laboratories.

a. UL 305: Panic Hardware.

7. WHI: Warnock Hersey Incorporated.
8. SDI: Steel Door Institute.
9. NAAMM: National Association of Architectural Metal Manufacturers.

1.4 SUBSTITUTIONS

A. Substitutions: Substitutions will only be allowed by substitution requests submitted in accordance with Division 01 Section “Substitution Procedures” prior to the bid date.

1. In Part 2 Articles where manufacturers are listed for various product types and only one manufacturer is listed with no alternate manufacturers indicated, manufacturer listed is an established Owner standard and substitutions will not be allowed.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule. Organize schedule vertically into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Include the following information:

1. Type, style, function, size and finish of each hardware item.
2. Name, part number and manufacturer of each item.
3. Fastenings and other pertinent information.
4. Location of hardware set coordinated with floor plans and door schedule.
5. Explanation of all abbreviations, symbols and codes contained in schedule.
6. Mounting locations for hardware.
7. Door and frame sizes and materials.
8. List of manufacturers used and their nearest representative with address and phone number.
9. Keying information.
10. Manufacturer’s catalog cut sheets.

C. Meeting and Conference Minutes: For Keying and Preinstallation conferences.

D. Qualification Data: For Door Inspector. Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4 and/or a copy of DHI's Fire and Egress Door Assembly Inspector (FDAI) certificate.

E. Field quality-control reports.

F. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include “as installed” final hardware and keying schedule.

G. As-Built Schedule: As-built/as-installed schedule with closeout documents, including keying schedule, wiring diagrams, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

H. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in the installation of commercial door hardware with five years documented experience.

B. Supplier Qualifications: A recognized architectural door hardware supplier with warehousing facilities in the Project's vicinity that has a record of successful in-service performance for supplying door hardware that is similar in quantity, type, and quality to that specified for this Project, and who employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.

C. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

1. Architectural Hardware Consultant Responsibilities:

    a. Detailing, scheduling and ordering of finish hardware.
    b. Meeting with Owner to finalize keying requirements and to obtain final instructions in writing.
    c. Stock parts for products supplied and be capable of repairing and replacing hardware items found defective within warranty periods.

D. Door Inspector Qualifications: Inspector for field quality-control inspections shall comply with the following:

1. Fire Rated Door Assemblies: Comply with qualifications set forth in NFPA 80, Section 5.2.3.
2. Egress Door Assemblies: comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4.
3. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

1.7 CONFERENCES AND MEETINGS

A. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Conference participants shall include Owner's lock system representative, Supplier's Architectural Hardware Consultant Contractor, and Architect. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Attendees shall include Owner, Contractor, Architect, Project Inspector, Installer, and Supplier's Architectural Hardware Consultant. Review methods and procedures related to door hardware including, but not limited to, the following:

1. Hardware products and schedule.
2. Installation procedures and coordination required with related work.
3. Review Owner's keying standards.

1.8 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of packaged hardware items to the appropriate locations for installation.

B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.

C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, and chemicals.

D. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

E. Deliver permanent keys and cores directly from lock manufacturer to Owner's designated representative by secured delivery.

1.9 COORDINATION

A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Keying: Coordinate keying, and access control with Owner's lock hardware staff and/or consultant.

C. Review, compare, and coordinate scheduled hardware with doors, frames, and adjacent floor and wall conditions for non-compatible mounting and/or operating conditions; notify Architect in writing of any conflicts.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees 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 door hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Established from date of Substantial Completion as follows:

a. Closers: Thirty (30) years.
b. Locksets: Three (3) years
c. All other hardware: Two (2) years.

1.11 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies same as those used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND REGULATORY REQUIREMENTS

A. Regulatory Requirements: Comply with the 2010 ADA Standards for Accessible Design, ANSI A117.1, and the 2022 California Building Code.

1. Opening Hardware, Mounting Height and Operation: Operable parts of door hardware shall be 34 inches minimum and 44 inches above the floor. Hand activated door opening hardware shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist to operate; the force required to activate operable parts shall not exceed 5 lbs. Egress doors shall be readily openable from the egress side without the use of a key or special knowledge or effort. The unlatching of any door or leaf shall not require more than one operation (CBC 11B-309.4 & 11B-404.2.7, 1010.1.9, 1010.1.9.6).

2. Closers, Opening Force: The opening force shall be the push/pull effort applied perpendicular to the face of the door at the operating hardware. Other than required fire rated doors, the effort to operate doors shall not exceed 5 pounds; the effort to operate required fire rated doors shall be the minimum force allowable by the appropriate administrative authority and shall not exceed 15 pounds (CBC 11B-404.2.9).
3. Closers, Closing Sweep Period: The closing sweep period for doors shall be such that from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch (CBC 11B-404.2.8.1).
4. Thresholds: The height differential between the tops of thresholds and adjacent floor or landing surfaces shall not be more than 1/2 inch; offsets exceeding 1/4 inch shall be beveled with a 2:1 (horizontal to vertical) maximum slope (2022 CBC 11B-404.2.5).
5. Smooth Door Surface: The bottom 10 inches of doors shall have a smooth, uninterrupted surface to allow the door to be opened by a wheel chair footrest without creating a trap or hazardous condition (CBC 11B-404.2.10).
6. Newly constructed K-12 school buildings shall include locks that allow doors to classrooms and any room with an occupant load of five or more persons to be locked from the inside; such locked doors shall always be openable for egress from inside the room; exceptions include student restrooms and doors that are normally locked from the outside such as janitor's rooms, equipment rooms, and storage rooms (CBC 1010.1.11).

2.2 SCHEDULED DOOR HARDWARE

A. Scheduled Door Hardware: Door hardware sets are included in the Door Hardware Schedule at the end of this Section; provide door hardware for each door to comply with requirements in this Section and the Door Hardware Schedule.

1. Scheduled door hardware is based on products by the manufacturers listed below for various hardware types indicated.

HARDWARE TYPE	BASIS OF DESIGN MANUFACTURER	MANUFACTURERS OF COMPARABLE PRODUCTS
Butt Hinges	Ives	Hager, Stanley
Lock and Latch sets, Cylinders, and Key System	Schlage	
Exit Devices	Von Duprin	
Closers	LCN	
Door Trim (Pulls, Plates, Bolts, Coordinators, Stops)	Ives	Trimco
Thresholds and Seals	Zero	National Guard Products

B. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware unless otherwise indicated.

C. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.

2.3 DOOR HARDWARE PRODUCTS

A. General: Door hardware products shall comply with preceding "Performance and Regulatory Requirements" Article.

B. Butt Hinges: Full mortise, 3 or 5 knuckle ball bearing hinges with flat button tips, weight as indicated.

1. Size: As indicated in schedule, not less than 4.5 x 4.5 inches.
2. Material:

    a. Interior Fire Rated Openings: Steel hinge with steel pin.
    b. Interior Non-Fire Rated Openings: Steel or Brass hinge with steel pin.
    c. Exterior Doors: Stainless steel hinge with stainless steel pin, and with non-removable pins.

3. Quantity per Door Leaf:

    a. 2 hinges for doors with heights up to 60 inches.
    b. 3 hinges for doors with heights of 61 to 90 inches.
    c. 4 hinges for doors with heights of 91 to 120 inches.

C. Lock and Latch Sets: Cylindrical or mortise latch/lock sets as scheduled with lever handled trim and as follows:

1. Lever Handles: Comply with requirements of SFM Standard 12-10-2, Section 12-10-202 contained in the CCR, Title 24, part 12, California Referenced Standards Code.
2. Breakaway Exterior Levers: Exterior doors shall be provided with independent security breakaway levers, breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.
3. Backset: 2-3/4 inches unless otherwise indicated.
4. Mortise Locksets:

    a. Chassis: Cold-rolled steel, handing field-changeable without disassembly.
    b. Latchbolt and Deadbolt: 3/4 inch minimum latch throw, 1 inch minimum deadbolt throw, stainless steel anti-friction type.
    c. Lever Trim: through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.

d. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.
e. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction and lips of sufficient length to clear trim and protect clothing.
f. Certifications:

1) ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.
2) ANSI/ASTM F476-84 Grade 31 UL listed.

D. Exit Devices: Surface mounted rim type exit devices as scheduled.

1. Certifiable by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 - 1994 standards.
2. Handing: Non-handed basic device design with center case interchangeable with all functions.
3. Fluid Damper Return: Devices shall have quiet return fluid dampeners.
4. Latchbolts: Latchbolts shall be deadlocking with ¾" throw and have a self-lubricating coating to reduce friction and wear.
5. Outside Trim: As scheduled; where operating levers are provided, provide manufacturer's standard "breakaway" feature for lever trim.
6. Strikes: All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
7. Fasteners: Exit Devices to be sex-bolted through doors.
8. Glazing Bead Kits: Furnish glass bead kits where required for doors with glazing.
9. Removable Mullions: Provide keyed removable mullions where indicated for pairs of doors with rim style exit devices.

E. Surface Closers: Fully adjustable full rack-and-pinion type cylinder with cast iron body and non-ferrous cover, heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring, and as follows:

1. ISO 2000 certified; units stamped with date-of-manufacture code.
2. Certifiable by independent testing laboratory that device has completed over 10,000,000 cycles and can still meet ANSI/BHMA A156.4
3. Non-sized, non-handed, and fully adjustable with separate adjusting valves for closing speed, latching speed, and backcheck; and with a fourth valve for delayed action where scheduled.
4. Arms and Mounting: Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated:

a. Regular Arm: Pull side, door mounted, for doors swinging into rooms.
b. Parallel Arm: Push side, door mounted, for doors swinging out of rooms.
c. Provide extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
d. Supplemental Brackets: Coordinate closer mounting requirements with other hardware items and provide supplemental mounting brackets where required for a complete installation.

5. Fluid: Closers shall utilize a stable fluid withstanding a temperature range of 120 degrees F to -30 degrees F without requiring seasonal adjustment of closer speed to properly close the door. Fluid shall be non-flaming and shall not fuel door or floor covering fires.
6. Fasteners: Closers to be sex-bolted through doors.

F. Stops, Holders, and Bumpers: Provide units as scheduled; all doors shall be provided with a stop or bumper; stops and bumpers shall be mounted within 8 inches of the outside (strike) edge of the door and shall be not more than 4 inches from walls.

1. Overhead Stops: Provide surface mounted overhead stops where floor or wall stops, or closers with stops cannot be utilized.
2. Flip down door mounted stops shall not be allowed.

G. Protection Plates: Kick, armor, or mop plates, 0.050 inch thick stainless steel with four edges beveled, 2 inches less than door width; kick plates to be 10 inches high, mop and armor plate heights shall be as indicated.

H. Thresholds: Aluminum and as detailed or scheduled; provide at all exterior doors.

I. Door Bottoms and Sweeps: Provide sweep seals at out swinging exterior doors unless other types are scheduled.

J. Seals: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated, scheduled, or required for smoke rated openings.

1. Resilient Seal Material: Polyurethane, polypropylene, nylon brush, silicone rubber or solid high-grade neoprene as scheduled. Vinyl seal material shall not be acceptable.

K. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.4 LOCK CYLINDERS

A. Review and confirm lock cylinder requirements with Owner.

B. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.

2.5 KEYING

A. Review and confirm keying requirements and key system with Owner.

B. Furnish a Grand Master, Master, keyed alike or keyed different system as directed by the Owner or Architect.

C. Existing System: Schlage Everest Restricted “D”. Confirm lock cylinders and keying with Owner and provide system as directed by the Owner.

D. Key Blanks: Standard "6" pin bow key blank; tag to identify.

E. Supply keys and blanks as follows:

1. Supply 2 cut change keys for each different change key code.
2. Supply 1 uncut key blank for each change key code.
3. Supply 6 cut master keys for each different master key set.
4. Supply 3 uncut key blanks for each master key set.

2.6 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Architect.

1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
2. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
3. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.
4. Screws for butt hinges shall be flathead, countersunk, full-thread type.
5. Fastening of closer bases to doors shall be by means of sex bolts and spray painted to match closer finish.
6. Provide stainless steel expansion anchors for attaching hardware items to concrete or masonry.
7. All lock protectors shall be fastened to the door by the means of sex bolts or through bolts.

2.7 FINISHES

A. Provide finishes as indicated in door hardware schedule and as follows:

1. Plated Steel and Brass: Satin chromium US26D (626) unless otherwise noted.
2. Stainless Steel: Satin stainless steel US32D (630) unless otherwise noted.
3. Door Closers: Powder-coated to match other hardware, unless otherwise noted.
4. Aluminum: Clear anodized aluminum US28 (628), except thresholds which can be furnished as standard mill finish.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.

B. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.

B. Use the templates provided by hardware item manufacturer.

C. Mounting Heights: Mount door hardware units at heights to comply with Performance and Regulatory Requirements Article and as follows:

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."
4. Operating hardware shall be located between 34 and 44 inches above the floor to comply with requirements of the California Building Code and the 2010 ADA Standards for Accessible Design.

D. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

E. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

G. Thresholds: Set thresholds for exterior doors in a full bed of butyl-rubber sealant, secure to concrete substrates with 1/4 inch diameter stainless steel flat head sleeve anchors equally spaced not more than 12 inches on center and not more than 3 inches from ends.

H. If hand of door is changed during construction, make necessary changes in hardware at no additional cost to the owner.

3.3 ADJUSTING

A. Initial Adjustment: Approximately 2 weeks prior to completion or occupancy, check each operating item of door hardware for each door to ensure proper operation or function; adjust operational hardware as needed for proper operation. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Adjust door latches and closers with heating and ventilating equipment fans in operation in order to compensate for room-to-room or room-to-exterior air pressure differences.
2. Door Closers: Adjust door closers so that the effort to operate doors shall not exceed a 5 pound force for non-fire rated doors; the force for fire rated doors shall be the minimum force allowable by the appropriate administrative authority and shall not exceed 15 pounds; the force shall be the push/pull effort applied at right angles to hinged doors (CBC 11B-404.2.9). Adjust the sweep period for closers so that from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch (CBC 11B-404.2.8.1).

B. Occupancy Adjustment and Service: Approximately six months after the completion of the project, the Contractor, accompanied by the Architectural Hardware Consultant, shall return to the project and check each operating item of door hardware and each door to ensure proper operation or function of every unit; re-adjust hardware items to restore proper functions. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.4 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Supplier's Architectural Hardware Consultant (AHC), with installer present, shall inspect and test installed door hardware operation with the building's climate control system at rest and in full operation. Architectural Hardware Consultant shall certify that hardware has been furnished and installed in accordance with the Contract Documents, manufacturer's instructions, as specified herein, and that door hardware operates as intended.

C. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.

D. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.

E. Prepare and submit separate inspection reports for each fire-rated door assemblies and egress door assemblies indicating compliance with each item listed in NFPA 80 and NFPA 101, Section 7.2.1.15.6.

F. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

G. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surface soiled by hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DEMONSTRATION AND TRAINING

A. Instruct Owner's Personnel to adjust, operate, and maintain door hardware and door hardware finishes during the final adjustment of hardware.

3.7 DOOR HARDWARE SETS

A. The items listed in the following Hardware Sets shall conform to the requirements of the foregoing specifications.

B. The Door Schedule on the Drawings indicates hardware sets for each door.

C. Abbreviations for Manufacturers:

GLY	=	Glyyn-Johnson	Overhead stops, coordinators
IVE	=	Ives	Hinges, Door trim, bolts, plates
LCN	=	LCN	Door Closers
SCH	=	Schlage Lock Company	Locks, Latches & Cylinders
SCE	=	Schlage Electronics	Electronic Locks
TRI	=	Trimco	Protection Plates, & Stops
VON	=	Von Duprin	Exit Devices
ZER	=	Zero International	Applied Jamb Stops

D. Miscellaneous material:

25	EA	PROXIMITY KEYFOB	7610	SCE

E. Door Hardware Sets

HW SET: 01

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	EXIT DEVICE	AXPACD98NL X 990NL X CDSI	626	VON
1	EA	RIM CYLINDER	20-057-ICX (SPECIFY A, B OR C)	626	SCH
1	EA	MORTISE CYLINDER	20-061-ICX X XQ11-948 (SPECIFY A, B OR C) (DOGGING)	626	SCH
2	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4111 EDA X ST-1631	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
2	EA	JAMB SEALS	328A	AL	ZER
1	EA	HEAD SEAL	429A	AL	ZER
1	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	102A MS/LA	AL	ZER

INSTALL HEAD SEAL BEFORE CLOSER

HW SET: 02

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	L9050T 06A L583-363	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS438 435 436 437 AS REQU'D	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 03

3	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	PASSAGE SET	L9010 06A	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 04

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	LV9480T 06A	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4111 H EDA X ST-1631	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
2	EA	JAMB SEALS	328A	AL	ZER
1	EA	HEAD SEAL	429A	AL	ZER
1	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	102A MS/LA	AL	ZER

INSTALL HEAD SEAL BEFORE CLOSER

HW SET: 05

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	CORE ONLY	23-030	626	SCH
1	EA	ELECTRONIC LOCK	CO-200-MS-40-PRK-RHO-LFS	626	SCE
1	EA	SURFACE CLOSER	4111 EDA X ST-1631	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
2	EA	JAMB SEALS	328A	AL	ZER
1	EA	HEAD SEAL	429A	AL	ZER
1	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	102A MS/LA	AL	ZER

INSTALL HEAD SEAL BEFORE CLOSER

HW SET: 06

NOT USED

HW SET: 07

NOT USED

HW SET: 08

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	LV9480T 06A	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4111 H EDA X ST-1631	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
2	EA	JAMB SEALS	328A	AL	ZER
1	EA	HEAD SEAL	429A	AL	ZER
1	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	102A MS/LA	AL	ZER

INSTALL HEAD SEAL BEFORE CLOSER

HW SET: 09

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	L9050T 06A L583-363	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 10

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	CLASSROOM LOCK	LV9071T 06A X L283-711	626	SCH
2	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4111 EDA X ST-1631	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
2	EA	JAMB SEALS	328A	AL	ZER
1	EA	HEAD SEAL	429A	AL	ZER
1	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	102A MS/LA	AL	ZER

INSTALL HEAD SEAL BEFORE CLOSER

END OF SECTION

SECTION 088000
GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:

1. Glass for windows, doors, and storefront framing.

    a. Glass Types are indicated in glass type schedules at the end of this Section.

2. Glazing sealants and accessories.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.4 SUBMITTALS

A. Product Data: For each type of product; include statement of VOC content for any adhesives or sealants.

B. Glass Samples: For each type of glass product, other than clear monolithic glass, in 12-inch square samples for the following:

1. Tinted glass.
2. Coated glass
3. Insulating glass.

C. Glazing Accessory Samples: For sealants and colored spacers in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in installations with a record of successful in-service performance; and who employs glass installers for this Project who are experienced in installing glazing similar in material, design, and extent to that indicated for this Project.

B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

1.6 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.9 WARRANTY

A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: Where products are identified by manufacturer and product names, Design, Drawings, and Specifications are based on the product indicated; subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. Vitro Architectural Glass (Formerly PPG Industries, Inc.)
2. Guardian Industries.
3. Oldcastle Building Envelope.
4. Pilkington Building Products North America.
5. Viracon, Inc.

B. Source Limitations for Glass: Obtain glass from a single source from a single manufacturer for each glass type.

1. Obtain tinted glass from a single source from a single manufacturer.

C. Source Limitations for Glazing Accessories: Obtain accessories from a single source from a single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. California Code of Regulations, Title 24, Part 6, California Energy Code.

1. NFRC 100: Procedure for Determining Fenestration Product U-factors."
2. NFRC 200 Procedure for Determining Fenestration Product Solar Heat Gain Coefficients at Normal Incidence."
3. NFRC 400: Procedure for Determining Fenestration Product Air Leakage."

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the California Building Code and ASTM E 1300.

1. Design Wind Pressures: As indicated on Drawings.
2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publication: "Glazing Manual."

2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Identification: Where safety glazing is indicated, each pane of safety glazing shall be identified by a manufacturer's designation specifying who applied the designation, the manufacturer or installer and the safety glazing standard with which it complies, as well as the information specified in CBC Section 2403.1. The designation shall be acid etched, sand blasted, ceramic fired, laser etched, embossed, or of a type that once applied cannot be removed without being destroyed. A label meeting the requirements of CBC Section 2406.3 shall be permitted in lieu of the manufacturer's designation.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class I (clear), Quality-Q3.

B. Tinted Annealed Float Glass: ASTM C 1036, Type I, Class 2 (tinted), Quality-Q3.

C. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary seals.

2. Spacer: Manufacturer's standard spacer material and construction, aluminum with mill or clear anodic finish.
3. Desiccant: Molecular sieve or silica gel, or blend of both.

B. Glass: Comply with applicable requirements in Part 3 Article "Insulating Glass Schedule."

1. Provide Kind HS (Heat-strengthened) or Kind FT (Fully tempered) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.

2.6 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. VOC Content: Field applied sealants shall have a VOC content of not more than 250 g/L.
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 790.
b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
c. Tremco Incorporated; Spectrem 1.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Type recommended by sealant or glass manufacturer; EPDM, Silicone, Neoprene, or Santoprene; with a Shore A durometer hardness of 85, plus or minus 5.

D. Spacers: Type recommended by sealant or glass manufacturer; neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Type recommended by sealant or glass manufacturer; EPDM, Silicone, Neoprene, or Santoprene; with a Shore A durometer hardness per manufacturer's written instructions.

F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.9 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

a. Temperature Change: 120 deg F ambient; 180 deg F material surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lights.

F. Provide spacers for glass lights where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until immediately before each glazing unit is installed.

F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lights and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

3.8 INSULATING-GLASS SCHEDULE

A. Glass Type ITC: Clear insulating tempered glass.

1. Overall Unit Thickness: 1-inch (25mm).
2. Minimum Thickness of Each Glass Lite: 6.0 mm.
3. Outdoor Lite: Clear float glass. Fully tempered.
4. Indoor Lite: Clear float glass, Fully tempered.
5. Interspace Content: Clean-Dry-Air.
6. Visible transmittance: 79 Percent.
7. Winter Nighttime U-Factor: 0.47 maximum.
8. Summer Daytime U-Factor: 0.50 maximum.
9. Shading Coefficient: 0.81 maximum.
10. Solar Heat Gain Coefficient: 0.71 maximum.
11. Provide safety glazing labeling where tempered glass is specified

B. Glass Type ITT: Low-e coated, tinted, tempered insulating glass.

1. Basis of Design: Drawings and Specifications are based on the following:

a. Vitro Architectural Glass; Double Glazed Clear Solar Control Insulating Glass Unit (Graylite II), Solarban 60 on Clear (3).

2. Overall Unit Thickness: 1-inch (25mm).
3. Minimum Thickness of Each Glass Lite: 6.0 mm.
4. Outdoor Lite: Graylite II, tinted float glass. Fully tempered.
5. Indoor Lite: Clear, fully tempered float glass.

a. Magnetic Sputter Vacuum Deposition Coating.
b. Low-E Coating: Solarban 60 on Surface # 3.

6. Interspace Content: Clean-Dry-Air.
7. Visible transmittance: 7 Percent minimum.
8. Winter Nighttime U-Factor: 0.29 maximum.
9. Summer Daytime U-Factor: 0.27 maximum.
10. Shading Coefficient: 0.15 maximum.
11. Solar Heat Gain Coefficient: 0.13 maximum.
12. Provide safety glazing labeling where tempered glass is specified.

END OF SECTION

SECTION 089000
LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Fixed, extruded aluminum louvers.

1.3 DEFINITIONS

A. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.

B. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 FIXED, EXTRUDED ALUMINUM LOUVERS

A. Horizontal, Nondrainable-Blade Louvers:

B. Basis of Design: Design, Drawings and Specifications are based on the following products:

1. Ruskin Manufacturing; ELF30V with sight proof blades.

a. Size: Custom sizes as indicated on Drawings.
b. Louver Depth: 3 inches.
c. Frame Material: 6063T5 extruded aluminum (.081 inch nominal wall thickness).
d. Blade Material: 6063T5 extruded aluminum (.081 inch nominal wall thickness).
e. Blades: Sight proof chevron blades.
f. Free Area: Approximately 56% of louver area.
g. Insect Screen: Aluminum, 3/4” by 0.051 inch expanded and flattened.
h. Factory Finish: Kynar 500 Fluoropolymer finish. Color as selected by architect from Manufacturer’s full range of colors.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances and adjoining material tolerances.

1. Frame Type:

a. At Walls: Frames shall be fabricated with a 3/4 inch stucco flange around the perimeter of the exterior face of the louver.
b. At Transoms: Frames shall be fabricated to fit within hollow metal frames as detailed.

D. Aluminum Finishes: High-Performance Kynar 500 Finish.

1. Fluoropolymer finish complying with AAMA 2605-02 and not containing less than 70 percent PVDF resin by weight in both color. Total dry film thickness approximately 1.2 mils when baked at 450 degrees.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 07 Section "Joint Sealants" for sealants applied during louver installation.

3.3 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION

SECTION 099100
PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes surface preparation and field painting, staining or refinishing of the following:

1. Exposed exterior items and surfaces.
2. Exposed interior items and surfaces.
3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

1.3 SPECIAL REQUIREMENTS

A. Unauthorized removal or disconnecting of electrical fixtures, switches, or control devices may result in additional electrical work to comply with energy regulations of governing agencies. Contractor shall be financially responsible with no additional cost to the Owner for additional electrical work due to unauthorized removal or disconnecting of electrical fixtures, swithes, or control devices.

1.4 DEFINITIONS

A. Definitions of gloss levels below are from "MPI Architectural Painting Specification Manual" (hereafter, "MPI Manual").

1. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
2. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
3. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
4. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
5. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
6. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.5 SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on 8 inch square samples of actual material to be painted or stained. For masonry surfaces, include a mortar joint.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. VOC content.

E. Coating Maintenance Manual: Submit with Closeout/Maintenance Submittals a Coating Maintenance manual; manual shall include a floor plan with rooms identified by name and number, a finish schedule coordinated with the floor plan, designations of where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.

6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F.

1. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
2. Keep storage area neat and orderly. Remove oily rags and waste daily.
3. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.8 PROJECT CONDITIONS

A. Apply paints only when the temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Protection:

1. Cover or otherwise protect finished work of other trades, work not to be painted concurrently, landscaping, and adjacent property from damage.
2. When not in use, store paints in designated areas. Keep containers closed. At end of day's work, remove empty containers, paint soaked rags, and debris. Vent fumes. Take precautions to prevent fire.

D. Sequencing, Scheduling:

1. Coordinate removal and replacement of hardware, electrical fixtures and trim, and related work of other Sections.
2. Stain, prime, back paint, and pre-finish items before installation as required.

E. Cleaning and Disposal:

1. Do not use Project plumbing fixtures or piping systems for:

a. Cleaning painting equipment and utensils.
b. Disposal of waste from cleaning or disposal of paints.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Scheduled Paint Systems: Provide paint systems as scheduled on the Drawings and listed in Part 3 Article “Paint Systems” to comply with requirements in this Section.

1. Named Manufacturers' Products: Manufacturer and product designations indicated in the scheduled paint systems are for the purpose of establishing minimum requirements; unless otherwise indicated, paint products are based on products manufactured by the following:

    a. Sherwin Williams Paints.

        1) Subject to compliance with requirements, provide the named products or comparable products by one of the following:

            a) Dunn-Edwards Paints.
            b) Glidden Professional.
            c) PPG Paints.
            d) Tnemec.

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: 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.

1. 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.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

C. VOC Content: Paints and coatings applied at the Project site shall comply with VOC limits of authorities having jurisdiction; VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); and VOC limits of the California Green Building Standards Code (CGBSC), Section 5.504.4.3 and Table 504.4.3 as follows:

1. Flat Paints and Coatings: VOC not more than 50 g/L.
2. Nonflat Paints and Coatings: VOC not more than 100 g/L.
3. Nonflat High-Gloss Paints and Coatings: VOC not more than 150 g/L.
4. Dry-Fog Coatings: VOC not more than 150 g/L.
5. Floor Coatings: VOC not more than 100 g/L.
6. Pretreatment Wash Primers: VOC not more than 420 g/L.
7. Primers, Sealers, and Undercoaters: VOC not more than 100 g/L.
8. Rust Preventative Coatings Applied to Ferrous Metals: VOC not more than 250 g/L.
9. Shellacs, Clear: VOC not more than 730 g/L.
10. Shellacs, Pigmented: VOC not more than 550 g/L.
11. Stains: VOC not more than 250 g/L.
12. Clear Wood Finishes, Varnishes: VOC not more than 275 g/L.
13. Clear Wood Finishes, Lacquers: VOC not more than 275 g/L.
14. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.

D. Colors: Provide color selections made by the Architect. Colors shall be factory mixed and match approved samples.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Portland Cement Plaster: 12 percent.
5. Gypsum Board: 12 percent.

C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.

D. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

E. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

F. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

G. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect of anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. Electrical Items: Remove only switch and outlet cover plates and similar items that do not require disconnecting wiring. Do not disconnect wiring or remove electrical fixtures, swithes, or control devices unless otherwise indicated on Electrical Drawings.

    a. Contractor may be subject to additional costs due to unautorized removal of items, refer to Part 1 Article “Special Requierments.”

2. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
2. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

D. Concrete and Masonry Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Perform appropriate tests to determine alkalinity and moisture content of surfaces; testing shall be performed or witnessed by a certified representative of the paint manufacturer. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

1. Cracks and defects at concrete and masonry surfaces shall be filled with cement grout; match surface texture.
2. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. Steel Structures Painting Council's (SSPC), SSPC-SP 3, "Power Tool Cleaning."

2. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Aluminum Substrates: Remove loose surface oxidation.

I. Wood Substrates: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required.

1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood.

    a. When transparent finish is required, backprime with spar varnish.
    b. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
    c. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

J. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

K. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

L. Drywall: Fill any cracks or defects with drywall joint compound. Sand any rough spots smooth. Do not raise nap on paper covering.

3.3 APPLICATION

A. General: Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual." Paint/stain exposed surfaces, except where schedules indicate that a surface or material is not to be painted/stained or is to remain natural. If schedules do not specifically mention an item or surface to be painted, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.

4. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
7. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
8. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
9. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

    a. Prefinished items include the following factory-finished components:

        1) Aluminum storefronts and entrances.
        2) Anodized aluminum gypsum board and plaster trim.
        3) Acoustical wall panels.
        4) Toilet and urinal partitions.
        5) Stainless steel items.
        6) Finished mechanical and electrical equipment.
        7) Light fixtures.
        8) Distribution cabinets.

    b. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

D. Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

E. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions and recommendations in "MPI Manual."

1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

F. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

G. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

H. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

I. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

J. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

K. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

M. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work: Paint the following work where exposed to view at applications indicated:

1. Equipment rooms:

    a. Telecommunications backboards; paint with intumescent paint.

2. Occupied areas:

    a. Equipment, including panelboards.
    b. Uninsulated metal piping.
    c. Uninsulated plastic piping.
    d. Pipe hangers and supports.
    e. Metal conduit.
    f. Plastic conduit.
    g. Ducts, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    h. Interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
    i. Other items as directed by Architect.

3. Exterior locations:

    a. Uninsulated metal piping.
    b. Uninsulated plastic piping.
    c. Pipe hangers and supports.
    d. Metal conduit.
    e. Plastic conduit.

3.4 CLEANING AND PROTECTION

A. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

E. Correction of Defective Work:

1. Repair abraded, damaged or incomplete paint surfaces by methods acceptable to Architect. Spot repairs to be well-blended into adjacent work. For large repairs, re-coat entire plane or building element in which damaged area occurs.
2. Defaced surfaces of work not to be painted shall be cleaned and their original finish restored.

F. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 PAINT SYSTEMS

(Interior and exterior paint systems are on the following pages)

A. Interior Paint Systems:

SURFACE		PAINT SYSTEM		COATS	MANUFACTURER'S DESIGNATION	
(1)	Gypsum Drywall	P12.A	Flat, Latex	First Coat Second Coat Third Coat	B28 B30 B30	ProMar 200 Zero Primer ProMar 200 Zero Flat ProMar 200 Zero Flat
		P12.B	Semi-Gloss Latex	First Coat Second Coat Third Coat	B28 B31 B31	ProMar 200 Zero Primer ProMar 200 Zero SG ProMar 200 Zero SG
		P12.C	Eggshell Enamel Latex	First Coat Second Coat Third Coat	061 B20 B20	ProMar 200 Zero Primer ProMar 200 Zero EG ProMar 200 Zero EG
	(Textured)	P12.D	Flat	One Coat	A44	Tuff Surface
(2)	Wood	P13.A	Semi-Gloss Latex	First Coat Second Coat Third Coat	B28 B31 B31	Premium Wall & Wood ProMar 200 Zero SG ProMar 200 Zero SG
		P13.B	Eggshell Enamel, Latex	First Coat Second Coat Third Coat	168 A75 A75	Premium Wall & Wood Solo EG Solo EG
		P13.C	Lacquer Velvet	Stain First Coat Second Coat Third Coat	 15700 27520 27520	Minwax 250 Sanding Sealer High Solids Velvet Lacquer High Solids Velvet Lacquer
		P13.D	Lacquer Semi-Gloss	Stain First Coat Second Coat Third Coat	 15700 27540 27590	Minwax 250 Sanding sealer High Solids S.G. Lacquer High Solids S.G. Lacquer
		P13.E	Lacquer Gloss	Stain First Coat Second Coat Third Coat	 15700 27590 27590	Minwax 250 Sanding Sealer High Solids Gloss Lacquer High Solids Gloss Lacquer
		P13.F	Varnish Velvet	Stain First Coat Second Coat Third Coat	 A68 A68 A68	Minwax 250 Wood Classics Wood Classics Wood Classics
		P13.G	Varnish Semi-Gloss	Stain First Coat Second Coat Third Coat	 A68 A68 A68	Minwax 250 Wood Classics Wood Classics Wood Classics
(2A)	Telecom Plywood Backboard	P13.H	Intumescent Paint	Primer First Coat Second Coat		(Primer if req. by intumescent paint mfr) Flame Stop IM Flame Stop IM

SURFACE		PAINT SYSTEM		COATS	MANUFACTURER'S DESIGNATION	
(3)	Ferrous Metal	P14.A	Flat Latex	First Coat Second Coat Third Coat	B66310 A74 A74	ProCryl Metal Primer Solo Flat SoloFlat
		P14.B	Semi-Gloss Latex	First Coat Second Coat Third Coat	B66310 A76 A76	ProCryl Metal Primer Solo SG Solo SG
	Ferrous Metal (Cont.)	P14.C	Eggshell Latex	First Coat Second Coat Third Coat	B66310 A75 A75	ProCryl Metal Primer Solo EG Solo EG
(4)	Galvanized Metal/ Aluminum	P15.A	Flat Latex	First Coat Second Coat Third Coat	B66310 A74 A74	ProCryl Metal Primer Solo Flat Solo Flat
		P15.B	Semi-Gloss Latex	First Coat Second Coat Third Coat	B66310 A76 A76	ProCryl Metal Primer Solo SG Solo SG
		P15.C	Eggshell Latex	First Coat Second Coat Third Coat	B66310 A75 A75	ProCryl Metal Primer Solo EG Solo EG
(5)	Plaster, Concrete, Brick	P16.A	Flat Latex	First Coat Second Coat Third Coat	LX02 B30 B30	Loxon ProMar 200 Zero Flat ProMar 200 ZeroFlat
		P16.B	Semi-Gloss Latex	First Coat Second Coat Third Coat	LX02 B31 B31	Loxon ProMar 200 Zero SG ProMar 200 Zero SG
		P16.C	Eggshell Latex	First Coat Second Coat Third Coat	LX02 B20 B20	Loxon ProMar 200 Zero EG ProMar 200 Zero EG
(6)	Concrete Block	P17.A	Flat latex	First Coat Second Coat Third Coat	B25 B30 B30	PrepRite Block Filler ProMar 200 Zero Flat ProMar 200 Zero Flat
		P17.B	Semi-Gloss Latex	First Coat Second Coat Third Coat	B25 B31 B31	PrepRite Block Filler ProMar 200 Zero SG ProMar 200 Zero SG
		P17.C	Eggshell Latex	First Coat Second Coat Third Coat	B25 B20 B20	PrepRite Block Filler ProMar 200 Zero ProMar 200 Zero
(7)	Acoustical Ceiling Tile/ Plaster	P18.A	Latex	One Coat to Cover	A21	EcoSelect
(8)	Ceramic Tile like Finishes	P19.A	Epoxy	First Coat Second Coat Third Coat	B51 B73 B73	Multi Purpose Primer PI Waterbased Epoxy PI Waterbased Epoxy

SURFACE		PAINT SYSTEM		COATS	MANUFACTURER'S DESIGNATION	
(9)	Ceiling and Wall w/ misc. Pipes & Conduit Exposed, Trusses & Beams w/Spray-on Fire Insulation	P20.A	Latext Dry Fall	One Coat	B42	PI Waterbased Dryfall White or Black

(Exterior Paint Systems start on the following page)

B. Exterior Paint Systems:

SURFACE		PAINT SYSTEM		COATS	MANUFACTURER'S DESIGNATION	
(1)	Plaster, Concrete	P50.A	Flat, Acrylic	First Coat Second Coat Third Coat	LX02 A6 A6	Loxon A-100 A-100
		P50.B	Low Sheen Enamel Acrylic	First Coat Second Coat Third Coat	LX02 126 126	Loxon A-100 A-100
		P50.C	Elastomeric (Smooth) 5 year labor warranty	First Coat Second Coat Third Coat (Spray App.)	LX02 CF12 CF12	Loxon Masonry Primer Conflex XL Conflex XL
		P50.D	Elastomeric (Medium Aggregate) 5 year labor warranty	First Coat Second Coat Third Coat	LX02 CF12 CF12	Loxon Masonry Primer Conflex XL Conflex XL
(2)	Concrete Block Masonry	P51.A	Flat, acrylic emulsion	First Coat Second Coat Third Coat	B25 A6 A6	PrepRite Block Filler A-100 A-100
		P51.B	Elastomeric Smooth 5 year labor warranty	First Coat Second Coat Third Coat	LX02 CF12 CF12	Loxon Masonry Primer Conflex XL Conflex XL
		P51.C	Elastomeric (Medium Aggregate) 5 year labor warranty	First Coat Second Coat Third Coat	LX02 CF12 CF12	Loxon Masonry Primer Conflex XL Conflex XL
		P51.D	Elastomeric (Coarse Aggregate)	First Coat Second Coat Third Coat	LX02 CF12 CF12	Loxon Masonry Primer Conflex XL Conflex XL
		P51.E	Clear Water Repellent 10 year Warranty	1 Coat	LX31	Loxon 40% Water Repellant (A31T40)
(3)	Wood	P53.A	Flat Acrylic Emulsion	First Coat Second Coat Third Coat	B42 A6 A6	Exterior Wood Primer A-100 A-100
		P53.B	Semi-Gloss Acrylic	First Coat Second Coat Third Coat	B42 A76 A76	Exterior Wood Primer Solo SG Solo SG
		P53.C	Low Sheen Enamel Acrylic	First Coat Second Coat Third Coat	B42 A75 A75	Exterior Wood Primer Solo LS Solo LS

SURFACE		PAINT SYSTEM		COATS	MANUFACTURER'S DESIGNATION	
(3) (Cont.)	Wood	P53.D	Flat, Stain, Water Base, Semi-Transp.	First Coat Second Coat	A15T A15T	Deckscapes ST Stain Deckscapes ST Stain (A15T00215)
		P53.E	Flat, Stain Opaque	First Coat Second Coat	A6 A6	A100 A100
		P53.F	Varnish Clear Gloss	First Coat Second Coat Third Coat	6509 6509 6509	McCloskey's Spar McCloskey's Spar McCloskey`s Spar
		P53.G	Stain and Varnish	First Coat Second Coat Third Coat	 6509 6509	Aqua Seal McCloskey's McCloskey's
(4)	Ferrous Metal	P55.D	Gloss, High Perform.	First Coat Second Coat Third Coat	646 B65 B65	Macropoxy Epoxy Acrolon 100 Acrolon 100
		P55.E	Semi-Gloss High Perform.	First Coat Second Coat Third Coat	B66-310 B66 B66	ProCryl Primer Pro Ind DTM Acrylic Pro Ind DTM Acrylic
(5)	Galv. Metal & Aluminum	P56.A	Gloss	First Coat Second Coat Third Coat	B66-310 A77 A77	ProCryl Primer Solo GL Solo GL
		P56.B	Flat, Acrylic	First Coat Second Coat Third Coat	B66-310 A74 A74	ProCryl Primer Solo Flat Solo Flat
		P56.C	Semi-Gloss Enamel Acrylic	First Coat Second Coat Third Coat	B66-310 B53 B53	ProCryl Primer PI WB Urethan Enamel PI WB Urethan Enamel
		P56.D	Gloss	First Coat Second Coat Third Coat	B66-310 A77 A77	ProCryl Primer Solo GL Solo GL
		P56.E	Semi Gloss	First Coat Second Coat Third Coat	B66-310 A76 A76	ProCryl Primer Solo S/G SoloS/G
(6)	Galv. Metal & Aluminum	P57.C	Gloss High Perform.	First Coat Second Coat Third Coat	646 B65 B65	Marcopoxy Epoxy Acrolon 100 High Gloss Acrolon 100 High Gloss
	High Perf.	P57.D	Semi-Gloss High Perform.	First Coat Second Coat Third Coat	B71Y1 B66 B66	DTM Wash Primer Pro Ind DTM Acrylic Pro Ind DTM Acrylic

END OF SECTION

SECTION 102600
WALL PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Resilient wall rails.
2. Resilient corner guards.

B. Related Sections:

1. Division 08 Section "Door Hardware" for metal armor, kick, mop, and push plates for doors.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.

B. Shop Drawings: For each impact-resistant wall protection unit showing locations and extent. Include sections, details, and attachments to other work.

C. Samples for Initial Selection: For each type of impact-resistant wall protection unit indicated involving color.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Wall Accent Rails: 12 inches long; include examples of joinery, end and corner caps, and field splices.
2. Corner Guards: 12 inches long; include examples of end caps.
3. Impact-Resistant Wall Covering: 6 by 6 inches square.
4. Door-Surface Protection: 6 by 6 inches square.

E. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining optimum condition of resilient products under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

F. Warranty: Sample of special warranty.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
2. Keep plastic materials out of direct sunlight.
3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
4. Store products either in a vertical or horizontal position as indicated by the manufacturer.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of wall protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of wall protection products from a single source from a single manufacturer.

2.2 RESILIENT WALL PROTECTION UNITS

A. Surface Burning Characteristics for Resilient Products: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

B. Basis-of-Design Manufacturer: Where named manufacturer and product are indicated, Design, Drawings, and Specifications are based on products manufactured by the following:

1. Construction Specialties Inc.

a. Subject to compliance with requirements, provide products indicated or comparable products by one of the following:

1) Balco, Inc.
2) IPC Door and Wall Protection Systems; Division of InPro Corporation.
3) Korogard Wall Protection Systems; a division of RJF International Corporation.

C. Wall Rail, Resilient: Assembly consisting of continuous snap-on vinyl/acrylic cover installed over concealed, continuous retainer.

1. Basis-of-Design: Construction Specialties Inc.; Model FR-125 Accent Rail.
2. Cover: Extruded vinyl/acrylic (Acrovyn), minimum 0.078-inch wall thickness; as follows:

a. Profile: Extended half-round.

1) Dimensions: Nominal 1-1/8 inches high by 1-1/8 inch deep.
2) Surface: Shadow grain texture.

b. Color and Texture: As selected by Architect from manufacturer's full range of not less than 60 solid colors.

3. Continuous Retainer: Manufacturer’s standard continuous retainer of recycled vinyl/acrylic compound.

4. End Caps and Corners: Manufacturer’s standard prefabricated matching end and corner caps designed for installation with concealed mechanical fasteners; field adjustable for close alignment with snap-on cover.
5. Mounting: Continuous retainer to be surface mounted directly to solid backing in wall.
6. Surface-Burning Characteristics: ASTM E 84, Class 1, flame spread of 25 or less and smoke developed of 450 or less.

D. Corner Guards, Resilient, Surface-Mounted: Assembly consisting of snap-on plastic cover installed over continuous retainer; including mounting hardware; fabricated with 90 or 135-degree turn to match wall condition.

1. Basis-of-Design: Construction Specialties Inc.; Models SM-20N.
2. Cover: Extruded vinyl/acrylic (Acrovyn), minimum 0.078-inch wall thickness; as follows:

    a. Profile: Nominal 3-inch long legs, 1/4-inch corner radius, and 3/8 inch projection from face of wall.
    b. Height: As indicated on Drawings.
    c. Color and Texture: As selected by Architect from manufacturer's full range of not less than 60 solid colors.

3. Retainer: One-piece, extruded aluminum, nominal 0.062-inch thick.
4. Top and Bottom Caps: Manufacturer’s standard prefabricated matching top and bottom caps designed for installation with concealed mechanical fasteners; field adjustable for close alignment with snap-on cover.
5. Mounting: Continuous retainer to be surface mounted directly to solid backing in wall.
6. Surface-Burning Characteristics: ASTM E 84, Class 1, flame spread of 25 or less and smoke developed of 450 or less.

2.3 MATERIALS

A. Vinyl/Acrylic Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout; extruded and sheet material, thickness as indicated.

1. Impact Resistance: Minimum 25.4 ft-lbf/in. of notch when tested according to ASTM D 256, Test Method A.
2. Chemical and Stain Resistance: Tested according to ASTM D 1308.
3. Self-extinguishing when tested according to ASTM D 635.
4. Flame-Spread Index: 25 or less.
5. Smoke-Developed Index: 450 or less.

B. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated, but with not less than strength and durability properties specified in ASTM B 221 (ASTM B 221M) for Alloy 6063-T5.

C. Stainless-Steel Sheet: ASTM A 240/A 240M.

D. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

2.4 FABRICATION

A. Fabricate wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.

B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire ratings, and other conditions affecting performance of work.

B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting and priming, before installing impact-resistant wall protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. General: Install wall protection products according to manufacturer’s written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings.
2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.

    a. Where splices occur in horizontal runs, splice retainers and plastic covers at different locations along the run, but no closer than 12 inches.
    b. Adjust end, top, and bottom caps as required to ensure tight seams.

B. Impact-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION

SECTION 102800
TOILET ROOM ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes the following:

1. Toilet room accessories.
2. Warm-air dryers.
3. Underlavatory guards.

B. Owner-Furnished Accessories: Owner-furnished Contractor installed accessories are indicated on the drawings.

C. Related Sections:

1. Division 06 Section “Rough Carpentry” for backing and blocking for supports for accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Electrical characteristics.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated on Drawings.
2. Identify products using designations indicated on Drawings.

C. Sample Warranty: For manufacturer's special warranty.

D. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC NFPA 70 by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

C. Coordinate backing for mounting accessories with wall framing.

D. Coordinate electrical power supply for electric power operated accessories.

1.6 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 (ten) or 15 (fifteen) years from date of Substantial Completion, warranty period as indicated in the Accessory schedule at the end of the Section.

PART 2 - PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Regulatory Requirements: Toilet room accessories and mounting heights of accessories to be used by persons with disabilities shall comply with accessibility requirements of the 2010 ADA Standards for Accessible Design and the California Building Code, Chapter 11B, “Accessibility to Public Buildings, Public Accommodations, Commercial Buildings, and Public Housing.”

B. Elements of Sanitary facilities shall be mounted at locations in compliance with CBC Sections 11B-602 through 11B-612.

C. Grab bars in toilet facilities and bathing facilities shall comply with CBC Section 11B-609.

1. Grab bars and any wall or other surface adjacent to grab bars shall be free of sharp or abrasive elements and shall have rounded edges. The space around the grab bars shall be as follows:

a. 1-1/2 inches between the grab bar and the wall.
b. 1-1/2 inches minimum between the grab bar and projecting objects below and at the ends.
c. 12 inches minimum between the grab bar and projecting objects above.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 TOILET ROOM ACCESSORIES

A. Scheduled Accessories: Accessories are scheduled at the end of this Section in Part 3 Article “Contractor Furnished and Installed Accessories.”

1. Basis of Design: Named manufacturers' products indicated in the accessory schedule for each accessory type indicated are for the purpose of establishing minimum requirements. Named products are based on the following manufacturer:

a. Bobrick Washroom Equipment, Inc.

1) Subject to compliance with requirements, provide products indicated or equivalent products by one of the following:

a) American Specialties, Inc.
b) Bradley Corporation.
c) General Accessory Manufacturing Co. (GAMCO)

B. Locks and Keys: Lockable accessories shall be provided with cylindrical locks and all locks shall be keyed alike. Provide each lockable accessory with not less than one key.

C. Finish: Exposed stainless steel surfaces of accessories shall have a satin finish unless otherwise indicated.

2.4 WARM-AIR DRYERS

A. Warm Air Dryers:

1. Basis-of-Design Product: Drawings and Specifications are based on the following:

    a. Dyson; Airblade V (low-voltage).

        1) Subject to compliance with requirements, provide specified warm air dryer or submit request for substitution.

2. Mounting: Surface mounted.
3. Operation: Touch free capacitive sensor activation.

    a. Operation Time: 12 seconds.

4. Cover Material and Finish: Polycarbonate, Sprayed Nickel.
5. Electrical Requirements: 100-120 V, 8.32 A, 1,000 W.

2.5 UNDERLAVATORY GUARDS

A. Underlavatory Guard:

1. Basis-of-Design Product: Drawings and Specifications are based on the following:

    a. Truebro, Inc., Lavguard2 series underlavatory guard.

        1) Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

            a) Plumberex Specialty Products, Inc.

2. Description: Antimicrobial, white molded-plastic underlavatory guard assemblies. Underlavatory guard assemblies shall cover waste piping and hot and cold water supply piping, allow service access without removing coverings, and shall prevent contact with hot surfaces and/or sharp objects.
3. Locations: Provide underlavatory guard assemblies at all lavatories and/or sinks in all toilet rooms, and at sinks in cabinets/counter tops that are indicated to be accessible to persons in a wheel chair.

2.6 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304 with satin finish, unless otherwise indicated.

B. Brass: ASTM B 19 flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel).

D. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

E. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.7 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.
2. Confirm and coordinate mounting heights and locations of support backing for accessories that are to be accessible to persons with disabilities to insure installed accessories will comply with accessibility requirements when installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected; commencement of work constitutes acceptance of conditions.

3.2 INSTALLATION

A. Install accessories according to manufacturers' written instructions and as indicated on Drawings. Use fasteners appropriate for substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

1. Accessories such as grab bars, towel bars, paper dispensers and soap dispensers, provided on or within walls, shall be installed and sealed to protect structural elements from moisture. Sealant shall not be visible in the finished installation. Sealant shall be mildew resistant silicone sealant as specified in Division 7 Section “Joint Sealants.”

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.3 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.4 ACCESORY LOCATIONS

A. General: Accessories shall be provided at locations indicated on drawings, for locations where accessories are not indicated, provide accessories as follows:

1. Paper Towel Dispensers: Provide one surface mounted paper towel dispenser for each single sink or lavatory location; where multiple sinks or lavatories occur in the same room or area, provide one towel dispenser for every 2 sinks or lavatories.
2. Soap Dispensers: Provide one surface mounted soap dispenser for each sink or lavatory.
3. Toilet Tissue Dispensers: Provide one surface mounted toilet tissue dispenser for each water closet.
4. Seat Cover Dispensers: Provide one surface mounted seat cover dispenser for each water closet.

END OF SECTION

SECTION 104415
FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Non-fire rated fire extinguisher cabinets for portable fire extinguishers.
2. Portable hand carried fire extinguishers.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.

1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate size of fire extinguisher cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire protection cabinets with wall depths.

C. Coordinate blocking and backing for wall anchorage of cabinets with wall framing.

1.5 WARRANTY

A. Special Warranty for Fire Extinguishers: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from a single source from a single manufacturer.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. J. L. Industries, Inc.; a division of Activar Construction Products Group.
2. Larsen's Manufacturing Company.
3. Potter Roemer LLC.

2.2 PORTABLE FIRE EXTINGUISHERS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers, General: Type, size, and capacity as indicated.

1. Valves: Manufacturer's standard.
2. Handles and Levers: Manufacturer's standard.
3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

C. Multipurpose Dry-Chemical Type in Steel Container: UL-rated, 2-A:10-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

1. Provide at locations where fire extinguishers or fire extinguisher cabinets are indicated except in Kitchens.

2.3 FIRE EXTINGUISHER CABINETS

A. Cabinet Type: Semi-recessed cabinet with box partially recessed in walls of sufficient depth suitable for fire extinguishers indicated, with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Cabinet Construction: Nonrated.
2. Cabinet Material: Cold-rolled steel sheet.
3. Wall Recess: Cabinet shall require of wall recess of no more than 4 inches.

B. Doors and Trim:

1. Trim Style: Rolled edge trim with 1-1/2-inch or 2-1/2-inch backbend depth as standard with manufacturer.

a. Projection from Wall: Cabinet, including trim and pull handles, shall not project more than 4 inches from the finished wall surface.

2. Material (Doors and Trim): Cold-rolled steel sheet.
3. Doors:

a. Style: Vertical duo panel with frame, duo panel adjacent to strike edge of door.
b. Door Glazing: Tempered float glass (clear).
c. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1) Latch and Pull: Manufacturer’s standard projecting door pull and friction latch.
2) Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
3) Hinge: Manufacturer’s standard continuous hinge, of same material and finish as trim permitting door to open 180 degrees.

C. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

D. Identification: Identify fire extinguishers in fire protection cabinets with the words “FIRE EXTINGUISHER” applied to the door.

1. Lettering shall comply with authorities having jurisdiction for letter style, size, spacing, and location.
2. Lettering Application Process: Silk screened or pressure sensitive vinyl letters.
3. Lettering Color: Red.
4. Lettering Orientation: Vertical.

E. Materials:

1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

    a. Finish: Manufacturer’s standard baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
    b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    c. Color: White.
2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.4 FABRICATION OF FIRE PROTECTION CABINETS

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS FOR CABINETS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.

B. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged fire extinguishers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for semi-recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire extinguishers, cabinets, and mounting brackets in locations indicated, and in compliance with requirements of authorities having jurisdiction.

B. Fire Extinguisher Cabinets: Fasten cabinets to structure, square and plumb.

1. Mounting Brackets: Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.
2. Mounting Height: Mount cabinets and brackets so that the top of installed fire extinguishers will not exceed 48 inches above the finished floor.

C. Bracket Mounted Fire Extinguishers: Fasten mounting brackets to surfaces, square and plumb.

1. Mounting Height: Mount brackets so that the top of installed fire extinguishers will not exceed 48 inches above the finished floor, and the bottom of extinguishers will not be more than 26-1/2 inches above the floor.

D. Identification: Apply identification lettering at locations indicated or as required by authorities having jurisdiction.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 122113
HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Horizontal louver blinds with aluminum slats.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type and color of horizontal louver blind indicated.

OMIT

C. Samples for Verification: For each type and color of horizontal louver blind indicated.

1. Slat: Not less than 12 inches long.

D. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain horizontal louver blinds through one source from a single manufacturer.

B. Product Standard: Provide horizontal louver blinds complying with WCSC A 100.1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver horizontal louver blinds in factory packages, marked with manufacturer and product name, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and dirty finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

A. Products: Subject to compliance with requirements, provide products manufactured by one of the following:

1. Hunter Douglas.
2. Levolor, a Newell Rubbermaid Company.
3. Springs Window Fashions Division, Inc.

OMIT

B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radiused corners.

1. Width: 1 inch.
2. Spacing: Manufacturer’s standard, 0.71 inch minimum, 0.79 inch maximum.
3. Thickness: Manufacturer's standard, not less than 0.006 inch.
4. Finish: Ionized, antistatic, dust-repellent, baked polyester finish.

C. Headrail: Manufacturer’s standard U-shaped steel headrail fully enclosing operating mechanisms on three sides, long edges returned or rolled, ends capped, and with baked enamel finish matching slats.

D. Bottom Rail: Manufacturer’s standard formed-steel tube shape with baked enamel finish matching slats, capped ends, and with enclosed ladders and tapes to prevent contact with sill.

E. Ladders: Manufacturer’s standard braided polyester string evenly spaced to prevent long-term slat sag.

F. Lift Cords: Manufacturer's Cordless lift and lock safety standard.

1. Lift Operation: Cordless

G. Tilt Control: Enclosed worm-gear mechanism and linkage rod; manually operated with clear plastic wand.

1. Length of Tilt Control: Length required to make operation convenient from floor level, bottom of wand shall be not more than 48 inches above the floor.
2. Tilt: Manufacturer's standard, full tilt, both directions.

H. Tilt-Control and Cord-Lock Position: Right side of headrail, unless otherwise indicated.

I. Valance: Manufacturer's standard integral with headrail or two slats, color matching blind.

J. Mounting: Ceiling mounting, permitting easy removal and replacement without damaging blind or adjacent surfaces and finishes; with spacers and shims required for blind placement and alignment indicated.

1. Provide intermediate support brackets if end support spacing exceeds spacing recommended by manufacturer for weight and size of blind.

K. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.

L. Colors, Textures, Patterns, and Gloss: As selected by Architect from manufacturer's full range.

2.2 HORIZONTAL LOUVER BLIND FABRICATION

A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.

OMIT

B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.

C. Lift-and-Tilt Mechanisms: Moving parts to be permanently lubricated.

D. Unit Sizes: Fabricate units in sizes to fill openings as follows (measured at 74 deg F):

1. Blind Units Installed between (inside) Jambs:

a. Width: 1/2 inch, plus or minus 1/8 inch, less than jamb-to-jamb dimension of opening in which each blind is installed, 1/4 inch clear to jamb on each side.
b. Height: 1/4 inch, plus or minus 1/8 inch, less than head-to-sill dimension of opening in which each blind is installed.

E. Installation Brackets: Designed for easy removal and reinstallation of blind, for supporting headrail, valance, and operating hardware, and for hardware position and blind mounting method indicated.

F. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to blind hardware and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.

G. Color-Coated Finish:

1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

H. Component Color: Provide rails, cords, ladders, and exposed-to-view metal and plastic components matching or coordinating with slat color, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install horizontal louver blinds level and plumb and aligned with adjacent units according to manufacturer's written instructions, and located so exterior slat edges in any position are not closer than 1 inch to interior face of glass. Install intermediate support as required to prevent deflection in headrail.

OMIT

B. Mounting: Install horizontal louver blinds with slat edges flush with finish face of opening if slats are tilted open.

3.3 ADJUSTING

A. Adjust horizontal louver blinds to operate smoothly, easily, safely, and free of binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean horizontal louver blind surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.

C. Replace damaged horizontal louver blinds that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

SECTION 131600
PREFABRICATED MODULAR STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions and Division 01 specification sections apply to work of this Section.

B. Appendix No. 1: Geotechnical Report.

C. Appendix No. 2: DSA CalGreen Requirements Checklist.

1.2 SUMMARY

A. Section includes prefabricated, clear span, permanent modular structures. The prefabricated modular structure shall be erected at the designated site within the State of California, complete and ready for use by Owner. All costs for regulatory approvals, including governing agency delegated design submittal, transportation to and installation at the site are to be included in the Bid Amount.

1. Extent of Prefabricated Modular Structure is shown on drawings and specified herein.
2. Temporary Facilities: A field office is not required for the Modular Building Contract.

B. Related Sections:

1. Division 01 Section “Multiple Contract Summary” for division of work between Modular Building Contractor and Site Work Contractor.
2. Division 01 Section “Alternates” for alternate bid requirements related to this Section.
3. Division 03 through 32 Specification Sections apply to work of this Section.

1.3 DEFINITIONS

A. Owner: Merced City School District

B. Architect: The entity contracted with the Owner to provide the schematic design and specifications of the modular building as well as design of the low voltage, fire alarm and data systems for the modular buildings.

C. Site Contractor: The entity contracted with the Owner to construct the site improvements and site utilities as well as installation of the low voltage, fire alarm and data devices and cabling for the modular buildings.

D. Modular Building Contractor: The entity contracted with the Owner to provide final structural design of the building foundations and modular buildings as well as factory-manufacture the buildings and install them on Owner's site.

1.4 BIDDER QUALIFICATIONS

A. Bidders shall be prequalified per the Owner's requirements, refer to Division 00 Sections.

B. The bidder must have a current, valid California Class B Contractor's license to perform the work of this contract.

C. The bidder shall have contracted for and completed construction of a minimum of FIVE (5) California K-12 public school district portable/modular construction projects, each with a Contract value of at least $3,000,000 within the past five (5) years.

D. Bidders shall give evidence of at least ten (10) consecutive years' experience in the construction of modular school buildings in California. Such evidence will be submitted with bid and is a condition of award.

1.5 BID PRICING

A. Bid Pricing: The bid price shall be itemized as indicated below and on the Bid Form.

1. Total Bid Price dollar amount.
2. Delegated Design Submittal: Dollar amount for delegated design submittal through regulatory agency (DSA) approval.
3. Construction: Dollar amount for construction following delegated design agency approval.

1.6 SUBMITTALS

A. General: Submit information as required by individual Division 03 through 32 Specification Sections for verification of conformance with requirements.

B. Product Data: For manufactured products and materials.

C. Samples: For all products or materials involving choices of color, pattern or texture; submit manufacturer's full-range color cards, or actual samples where feasible, for selection by Owner.

D. California Green Building Standards Code (CGBSC) Compliance: Submit documentation as necessary to demonstrate compliance with CGBSC Code Mandatory Measures as adopted by the Division of the State Architect (DSA). Submit letter signed by Modular Building Contractor certifying that modular building complies with requirements. Submit checklist (see Appendix 2) with information on where CGBSC requirements are addressed within submitted documents.

E. Shop Drawings: Submit shop drawings for Prefabricated Modular Structure complete with dimensions and other information needed to verify conformance with design criteria and specifications.

F. Delegated-Design Submittal/Governing Agency Approval: Project is under the jurisdiction of the California Division of the State Architect (DSA), manufacturer shall submit a delegated design submittal which must be approved by DSA prior to the start of construction.

1. Delegated Design Submittal shall be acceptable to the Architect and shall comply with all applicable the provisions of the California Code of Regulations.
2. Modular Building Manufacturer shall bear all costs for production of drawings, associated structural/energy calculations and reports.
3. Submittal shall include necessary drawings, plans, elevations, sections, details of modular buildings, fabrication and installation requirements, anchorage details, and structural calculations prepared, stamped, and signed by a structural engineer licensed in the State of California. The manufacturer shall be responsible for the design and engineering calculations, the drawings, and for responding to and resolving any comments or issues generated by DSA.
4. The Modular Building Contractor shall submit a complete Delegated Design Submittal to the Architect after receiving a Notice to Proceed within the time period stipulated in the Bidding Requirements.
5. The Delegated Design Submittal shall be submitted to the Architect, and the Architect will transmit the submittal to the Division of the State Architect.
6. Modular Building Manufacturer shall make all revisions and corrections to documents and resubmit as required in order to obtain DSA approval.
7. Manufacturer's representative and structural engineer shall accompany Architect for final DSA review and approval stamping at the designated office of DSA at no additional cost.

G. Division of the State Architect Approved Drawings: Drawings and calculations prepared under the responsibility of the Modular Building Manufacturer bearing an original stamp of approval from DSA shall be submitted to the Architect and they shall become the Architect's property.

H. Division of the State Architect Forms:

1. Form DSA 1-DEL, Delegation of Responsibility.
2. Form DSA 6-AE, Architect/Engineer Verified Report.
3. Form DSA 6-C, Contractor Verified Report.

I. Qualification Data: For the following:

1. Professional engineer responsible for preparing delegated design submittal.
2. Installer.

J. Mill Certificates: Signed by manufacturers, certifying that products furnished comply with requirements.

K. Welding certificates.

L. Certified mill test reports for structural steel, including chemical and physical properties.

M. Source quality-control reports.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Installer shall be the legal entity that manufactures the building modules; subcontracting of final installation will not be allowed. Installing entity shall have successfully completed at least five installations of similar size and complexity within the past three years. Employees of Installer shall be skilled and qualified for the work which they perform. There shall be one competent and fully experienced person designated as the responsible person in charge of all installation work and shall be on-site at all times work is performed.

B. Manufacturer Qualifications: Modular Building Manufacturer shall be an entity who is regularly engaged in fabrication and erection of Modular Structures of type and quality required for this Project. Manufacturer must have ten years of experience in the manufacture of modular buildings.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Testing and Inspecting: Comply with California Building Code and Division of the State Architect testing and inspecting requirements for in-plant and on-site work. Owner shall engage and pay for inspecting and testing entities. Retesting of Work that does not meet project requirements shall be paid for by the Owner and deducted from the contract sum.

E. Coordination: Refer to Division 01 sections for requirements on coordination of modular building work with site improvements by Site Contractor.

1.8 WARRANTY

A. Modular Building Contractor unconditionally guarantees that work will be done in accordance with requirements of contract and remain free of defects in workmanship and materials for a period of one (1) year from date of acceptance. Modular Building Contractor agrees to repair or replace any and all work that may prove to be not in accordance with requirements or contract or that may be defective in workmanship or material within guarantee period, without any expense whatsoever to the Owner, ordinary wear and tear and abuse or neglect excepted.

B. Modular Building Contractor agrees that within fourteen (14) calendar days after being notified in writing by the Owner of any work requiring repair or replacement under warranty, they will commence and prosecute with due diligence all work necessary to fulfill terms of this warranty, and to complete the work within a reasonable period of time.

1.9 PERFORMANCE REQUIREMENTS

A. Governing Codes: All work and materials shall comply with the requirements of California Code of Regulations Title 24, 2022 Editions (including supplements) of Parts 1 through 6, Part 11 – California Green Building Standards Code (CGBSC), regulations of the State Fire Marshal, and any other applicable state or local laws, ordinances and regulations (as required for permanent construction).

B. Modular Building:

1. Extent of work is shown on drawings.
2. Modular Building Identification: On each building module, affix a permanent metal tag, 3 inches x 1.5 inches minimum size, with the following information:

    a. Manufacturer’s Name.
    b. Manufacturer’s Address.
    c. DSA Application Number.
    d. Design Roof Loads.
    e. Design Wind Load.

3. All products and materials, shall be new and of the type and grades specified, unless otherwise indicated. The Modular Building Contractor shall, if requested, furnish evidence satisfactory to the Architect that such is the case.

4. Modular buildings shall consist of all new prefabricated modules, including roof, walls, windows, cabinetry, finishes, lighting, electrical, plumbing and mechanical services. Each module shall be engineered by the Modular Building Contractor as follows:

    a. A structural steel moment-resisting frame and wood panel framing system (light gauge, cold-formed primary frames not allowed. Light gauge metal framing allowed for secondary framing and architectural elements).
    b. Module bay dimensions may deviate slightly from that shown on plans in order to accommodate an approved manufacturer's structural system.
    c. Each module shall be capable of resisting all vertical and lateral loads during transportation.
    d. Design prefabricated components and necessary field connections required for erection to permit easy assembly.

5. Arrange modules as shown on drawings. Components must conform to architectural design appearance shown on plans and requirements specified hereinafter. When modules are assembled, joints shall blend in with the architecture of the building and be watertight.
6. The Architect's decisions regarding design aesthetics shall be binding on the Modular Building Contractor. Basic design loads, as well as auxiliary and collateral loads, are as follows:

    a. Exterior walls shall be designed to withstand wind loads perpendicular to wall plane equivalent to "Exposure C, 115 mph". This requirement applies to all exterior walls of building section even though configuration of building may be such that some walls are not exposed to wind.
    b. Roofs: Design live load of 20 psf. All roofs shall be designed as diaphragms for resisting applied horizontal loads. Building roof shall be sloped for drainage as indicated on plans. Roof framing shall be designed to withstand wind loads equivalent to "Exposure C; 115 mph".
    c. Design each member to withstand stresses resulting from combinations of loads that produce maximum percentage of actual to allowable stress in that member.

C. Energy Requirements: Modular Building Contractor shall be responsible for providing and submitting complete energy compliance documentation and calculations as required by California State Energy Code as established by the Energy Efficiency Standards for Buildings as prescribed by the California Energy Commission.

D. California Green Building Standards Code (CGBSC) Requirements: Modular Building Contractor shall be responsible for providing and submitting documentation as required by DSA and the Architect to demonstrate compliance with CGBSC Requirements.

E. Foundations: The building will be erected on a pit set foundation constructed by the Modular Building Contractor except as otherwise indicated for Alternate Bids.

1. The building pad shall be prepared by the site work contractor.
2. Concrete foundations for modular buildings including building footings, footing excavation, formwork, reinforcing steel, and concrete, subject to Alternate Bids requirements.

3. Under-building utilities (extend 6 inches beyond the building), subject to Alternate Bids requirements.

F. Plan Approval Agency Submittal:

1. Modular Building Contractor's building drawings, standard details, and specifications for building assemblies manufactured hereunder shall be submitted to governing authorities in compliance with governing codes, rules and regulations, and stamped approval obtained thereon as prescribed by state regulations. Modules must meet State of California, Department of General Services, Division of the State Architect construction requirements.
2. Additional drawings and instructions deemed necessary to carry out the work included in Contract shall be supplied to or by the Modular Building Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS, GENERAL

A. Materials and products for inclusion in modular structures are specified in Division 03 through Division 32 Sections included in the Project Manual.

B. Manufacturers/Products/Substitutions: Manufacturers and products listed are intended to establish a level of quality, size, and material type and finish unless specific products are required for continuity and consistency with Owner's existing facility. Substitutions will be considered when submitted in strict conformance with procedures and provisions of the General Requirements of these specifications. Products identified as part of bid documents are intended to establish current Owner standards only, and are not intended to certify CalGreen compliance. Contractor shall review CalGreen requirements and submit/substitute CalGreen compliant products as closely matching Owner standards based on Manufacturer and product type, meeting or exceeding standards thereof.

C. Single Product Responsibility: Provide products of the same manufacturer for each type of product incorporated into the work.

PART 3 - EXECUTION

3.1 COORDINATION AND EXAMINATION

A. It is the Contractor's responsibility to make all necessary prior arrangements with the Owner's authorized representative for access to building site and removal of obstructions, if necessary. Provide Owner with a plan of proposed property entry point and path of travel to the building site for approval at least two weeks prior to delivery.

B. Notify Architect and Owner at least 48 hours prior to delivery of modules on site.

C. Report any unacceptable conditions to the Architect. Do not deliver any building modules until unacceptable conditions have been corrected.

D. Coordinate and cooperate with the Site Contractor to prevent conflicts between the separate portions of work.

3.2 PROTECTION

A. Protect Owner's property, facilities and utilities from damage during transportation and erection of building modules. Repair or replace any damage to satisfaction of Owner.

3.3 INSTALLATION AT SITE

A. Site Construction: Once delivery of modules is made, erection shall commence immediately and be pursued in a timely and continuous manner until complete. All modules called for at that site shall be scheduled for delivery and erection in one continuous time frame.

B. Construction Progress: The Contractor shall furnish materials, articles and equipment in ample quantities and at such times as to assure uninterrupted progress of the work. Failure to provide adequate working force, or material of proper quality, or failure in any other respect to prosecute the work with diligence and force specified herein are grounds for declaring a default on the contract.

C. Set building modules plumb, level and square; straight and true to line with foundation.

D. Site Security: Security of the buildings against vandalism is the sole responsibility of the Site Contractor until completion and structures have been accepted by the Owner.

E. On-site Inspection: Arrange for inspections of work on-site by DSA as required by that agency. Submit copies of inspection reports to Architect and Owner.

3.4 CLEAN UP AND ADJUSTING

A. The adjacent site and the structures shall be cleaned and made ready for occupancy prior to acceptance by the Owners.

B. Test and adjust controls and operating functions. Repair or replace any damaged or malfunctioning hardware, fixtures, equipment or controls.

3.5 UTILITY HOOK-UPS

A. Utility Connections: All utility connection points shall be located per the approved drawings to accommodate hook-ups provided at the site. Unless otherwise indicated on drawings, extend utility connections 6 inches from building and terminate with appropriate temporary closures. Final utility connections are by the Sitework Contractor.

3.6 OWNER INSTRUCTION AND DOCUMENTATION

A. Provide instruction to Owner’s designated personnel in operation and maintenance of all equipment, fixtures and utilities included in the modular building.

B. Deliver operating manuals, parts lists and warranties for all equipment and fixtures in modular building to Owner.

C. Provide Owner with final certificate of occupancy from authorities having jurisdiction.

END OF SECTION

SECTION 220000

GENERAL PLUMBING PROVISIONS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

A. The preceding General Conditions shall form a part of this Section with the same force and effect as though repeated here. The provisions of this Section shall also apply to Division 22 of these Specifications and shall be considered a part of that Divisions.

1.2 CODES AND REGULATIONS

A. All work and materials shall be in accordance with 2022 rules and regulations of applicable codes. Nothing in these Drawings or Specifications is to be construed to permit work not conforming to these codes. Should the Drawings or Specifications call for material or methods of construction of a higher quality or standard than required by these codes, the Drawings and Specifications shall govern. Applicable codes and regulations include, but are not necessarily limited to, the following:

California Building Code	CCR Title 24, Part 2
California Electrical Code	CCR Title 24, Part 3
California Mechanical Code	CCR Title 24, Part 4
California Plumbing Code	CCR Title 24, Part 5
California Energy Code	CCR Title 24, Part 6
California Fire Code	CCR Title 24, Part 9
Local Codes	

1.3 DEFINITIONS

A. Provide: The term "provide" as used in these specifications or on the drawings shall mean furnish and install.

B. Piping: The term "piping" as used in these specifications or on the drawings shall mean all pipe, fittings, valves, hangers, insulation, etc. as may be required for a complete and functional system.

C. Ductwork: The terms "duct" or "ductwork" as used in these specifications or on the drawings shall mean all ducts, fittings, joints, dampers, hangers, insulation, etc. as may be required for a complete and functional system.

D. Wiring: The term "wiring" as used in these specifications or on the drawings shall mean all wiring, conduit, boxes, connections, transformers, relays, switches etc. as may be required for a complete and functional system.

1.4 PERMITS AND FEES

a.

A. The Contractor shall take out all permits and arrange for all tests in connection with

his work as required. All charges are to be included in the work.

1.5 COORDINATION OF WORK

A. Examination: Before starting work, thoroughly examine existing and newly completed underlying and adjoining work and conditions on which the installation of this work depends. Report to the Engineer in writing all conditions which might adversely affect this work.

B. Layout: Layout of materials, equipment and systems is generally diagrammatic unless specifically dimensioned. Some work may be shown offset for clarity. The actual locations of all materials, piping, ductwork, fixtures, equipment, supports, etc. shall be carefully planned prior to installation of any work in order to avoid all interference with each other, or with structural, electrical, architectural or other elements.

C. Verification: If discrepancies are discovered between drawing and specification requirements, the more stringent requirement shall apply. All conflicts shall be called to the attention of the Engineer prior to the installation of any work or the ordering of any equipment. No work shall be prefabricated or installed prior to this coordination. No costs will be allowed to the Contractor for any prefabrication or installation performed prior to this coordination. Verify the proper voltage and phase of all equipment with the electrical plans.

D. Location of Utilities Prior to Trenching or Earthwork: The Contractor shall notify the Owner a minimum of two business days prior to beginning trenching or earthwork. Prior to this notification, the Contractor shall have marked all proposed trenches with paint and shall have contacted a utility locating company and have had this company mark all found underground utilities with paint. The Contractor shall then coordinate and arrange for a site visit with the Owner to review the proposed trenching and/or earthwork areas. Trenching and/or earthwork shall not begin until the Owner agrees. Repair and/or compensation for repair of marked utilities is the responsibility of the Contractor. The Owner retains the right to either self-perform the repair or require the Contractor to complete the repair, as directed by the Owner. If while performing the work, the Contractor discovers utilities that have not been marked, the Contractor shall immediately notify the Owner verbally and in writing.

1.6 GUARANTEE

A. Guarantee shall be in accordance with the General Conditions. The Contractor shall repair any defects due to faulty materials or workmanship and pay for any resulting damage to other work which appears within the guarantee period. These Specifications may extend the period of the guarantee for certain items. Where such extensions are called for, or where items are normally provided with guarantee periods in excess of that called for in the General Conditions, the certificate of guarantee shall be furnished to the Owner through the Engineer.

1.7 QUIETNESS

A. Piping, ductwork and equipment shall be arranged and supported so that vibration is a minimum and is not transmitted to the structure.

1.8 DAMAGES BY LEAKS

A. The Contractor shall be responsible for damages caused by leaks in the temporary or permanent piping systems prior to completion of work and during the period of the guarantee, and for damages caused by disconnected pipes or fittings, and the overflow of equipment prior to completion of the work.

1.9 EXAMINATION OF SITE

A. The Contractor shall examine the site, compare it with Plans and Specifications, and shall have satisfied himself as to the conditions under which the work is to be performed. No allowance shall subsequently be made in his behalf for any extra expense to which he may be put due to failure or neglect on his part to make such an examination.

1.10 COMPATIBILITY WITH EXISTING SYSTEMS

A. Any work which is done as an addition, expansion or remodel of an existing system shall be compatible with that system.

1.11 MATERIALS AND EQUIPMENT

A. Materials and equipment shall be new unless otherwise noted. Materials and equipment of a given type shall be by the same manufacturer. Materials and equipment shall be free of dents, scratches, marks, shipping tags and all defacing features at time of project acceptance. Materials and equipment shall be covered or otherwise protected during construction as required to maintain the material and equipment in new factory condition until project acceptance.

1.12 SUBMITTALS

A. Shop Drawings: Within 30 days of contract award, the Contractor shall submit six copies of shop drawings for all materials, equipment, etc. proposed for use on this project. Material or equipment shall not be ordered or installed until written review is processed by the Engineer.

All shop drawings must comply with the following:

1. Shop drawings are required for all material and equipment items and shall include manufacturer's name and catalog numbers, dimensions, capacities, performance curves, and all other characteristics and accessories as listed in the specifications or on the drawings. Descriptive literature shall be current factory brochures and submittal sheets. Capacities shall be certified by the factory. FAX submittals are not acceptable.

2. All shop drawings shall be submitted at one time in a neat and orderly fashion in a suitable binder with title sheet including Project, Engineer and Contractor, table of contents, and indexed tabs dividing each group of materials or item of equipment. All items shall be identified by the specification paragraph number for which they are proposed. All equipment shall also be identified by the mark number as indicated on drawings.

3. All capacities, characteristics, and accessories called for in the specifications or on the drawings shall be high-lighted, circled or underlined on the shop drawings. Calculations and other detailed data indicating how the item was selected shall be included for items that are not scheduled. Data must be complete enough to permit detailed comparison of every significant characteristic which is specified, scheduled or detailed.

B. Substitutions: Manufacturers and model numbers listed in the specifications or on the drawings represent the standard of quality and features desired. Proposed substitutions shall comply with the Owner's General Requirements. Calculations and other detailed data indicating how the item was selected shall be included. The Contractor shall assume full responsibility that substituted items or procedures will meet the specifications and job requirements and shall be responsible for the cost of redesign and modifications to the work caused by these items. At the Engineer's request, furnish locations where equipment similar to the substituted equipment is installed and operating along with the user's phone numbers and contact person. Satisfactory operation and service history will be considered in the acceptance or rejection of the proposed substitution.

C. Review: Submittals will be reviewed for general conformance with the design concept, but this review does not guarantee quantity shown, nor does it supersede the responsibility of the Contractor to provide all materials, equipment and installation in accordance with the drawings and specifications. The Contractor shall agree that shop drawing submittals processed by the Engineer are not Change Orders; that the purpose of shop drawing submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept, that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use. The Contractor shall agree that if deviations, discrepancies or conflicts between shop drawings and design drawings and specifications are discovered either prior to or after shop drawing submittals are processed by the Engineer, the design drawings and specifications shall control and shall be followed. If a resubmittal is required, submit a complete copy of the Engineer's review letter requiring such with the resubmittal.

1.13 MANUFACTURER'S RECOMMENDATIONS

A. All material, equipment, devices, etc., shall be installed in accordance with the recommendations of the manufacturer of the particular item. The Contractor shall be responsible for all installations contrary to the manufacturer's recommendations. The Contractor shall make all necessary changes and revisions to achieve such compliance. Manufacturer's installation instructions shall be

delivered to and maintained at the job site through the construction of the project.

1.14 SCHEDULING OF WORK

A. All work shall be scheduled subject to the review of the Engineer and the Owner. No work shall interfere with the operation of the existing facilities on or adjacent to the site. The Contractor shall have at all times, as conditions permit, a sufficient force of workmen and quantity of materials to install the work contracted for as rapidly as possible consistent with good work, and shall cause no delay to other Contractors engaged upon this project or to the Owner. HVAC equipment and functions, whether existing or new, shall be maintained in operating condition whenever the facility is occupied, unless otherwise approved by the Owner.

1.15 DEMOLITION

A. Existing equipment, ducts, piping, etc. noted for removal shall be removed and delivered to the Owner at a location to be determined by the Owner. Those items determined by the Owner to be of no value shall become the property of the Contractor and shall be removed from the job site by the Contractor at the Contractor's expense. Existing piping, ducts, services, etc. requiring capping shall be capped below floors, behind walls, above ceilings or above roof unless otherwise noted. Where items are removed, patch the surfaces to match the existing surfaces.

1.16 HAZARDOUS MATERIAL REMOVAL

A. All hazardous material removal will be by the Owner. Hazardous material is to be removed before the work is started. If the Contractor discovers hazardous material which has not been removed, the Contractor shall immediately cease work in that area and promptly notify the Owner.

1.17 OPENINGS, CUTTING AND PATCHING

A. The locations and dimensions for openings through walls, floors, ceilings, foundations, footings, etc. required to accomplish the work under this Specification Division shall be provided under this Division. Except as noted below, the actual openings and the required cutting and patching shall be provided by other Divisions. Coring through existing concrete or masonry walls, floors, ceilings, foundations, footings, etc., and saw cutting of concrete floors or asphaltic concrete required to accomplish the work under this Specification Division shall be provided under this Division. Patching of these surfaces shall be provided by other Divisions. Cutting or coring shall not impair the strength of the structure. Any damage resulting from this work shall be repaired at the Contractor’s expense to the satisfaction of the Engineer.

1.18 EXCAVATION AND BACKFILL

A. General: Barrel of pipe shall have uniform support on sand bed. Sand shall be free from clay or organic material, suitable for the purpose intended and shall be of such size that 90 percent to 100 percent will pass a No. 4 sieve and not more than

5 percent will pass a No. 200 sieve. Unless otherwise noted, minimum earth cover above top of pipe or tubing outside building walls shall be 24", not including base and paving in paved areas.

B. Excavation: Width of trench at top of pipe shall be minimum of 16", plus the outside diameter of the pipe. Provide all shoring required by site conditions. Where over excavation occurs, provide compacted sand backfill to pipe bottom. Where groundwater is encountered, remove to keep excavation dry, using well points and pumps as required.

C. Backfill:

1. 6" Below, Around, and to 12" Above Pipe: Material shall be sand. Place carefully around and on top of pipe, taking care not to disturb piping, consolidate with vibrator.

2. One Foot Above Pipe to Grade: Material shall be sandy or silty loam, free of lumps, laid in 6" layers, uniformly mixed to proper moisture and compacted to required density. If backfill is determined to be suitable and required compaction is demonstrated by laboratory test, water compaction in 6" layers may be used, subject to review by Engineer.

D. Compaction: Compact to density of 95% within building and under walkways, driveways, traffic areas, paved areas, etc. and to 90% elsewhere. Demonstrate proper compaction by testing at top, bottom and one-half of the trench depth. Perform these tests at three locations per 100' of trench.

1.19 CONTINUITY OF SERVICES

A. Existing services and systems shall be maintained except for short intervals when connections are made. The Contractor shall be responsible for interruptions of services and shall repair damage done to any existing service caused by the work. If utilities not indicated on the drawings are uncovered during excavation, the Contractor shall notify the Engineer immediately.

1.20 PROTECTIVE COATING FOR UNDERGROUND PIPING

A. All ferrous pipe below grade (except cast iron) shall have a factory applied protective coating of extruded high density polyethylene, 35 to 70 mils total thickness, X-Tru-Coat, Scotchkote. All fittings and areas of damaged coating shall be covered with two layer double wrap of 10 mil polyvinyl tape to total thickness of 40 mils. John-Mansville. Protective coating shall be extended 6" above surrounding grade.

1.21 ACCESS DOORS

A. Provide access doors as required where equipment, piping, valves, ductwork, etc. are not otherwise accessible. Access doors shall match the wall or ceiling finish and fire rating as indicated on the Architectural drawings. 16-gage steel frame and 14-gage steel door with paintable finish, except in ceramic tile, where door shall be

16-gage stainless steel with satin finish. Continuous hinge. Deliver doors to the General Contractor for installation. Milcor. Unless otherwise noted, the minimum sizes shall be as follows:

1 valve up to 1-1/2”	12” x 12”
1 valve up to 3”	16” x 16”

1.22 CONCRETE ANCHORS

A. Steel stud with expansion wedge requiring a drilled hole – powder driven anchors are not acceptable. Minimum spacing shall be 12 diameters center to center and 10 diameters center to edge of concrete. Maximum allowable stresses for tension and shear shall be 80% of the ICC Evaluation Service Report (ESR) values. Minimum concrete embedment shall be the nominal embedment listed in the ESR table. Hilti Kwik Bolt TZ.

1.23 EQUIPMENT ANCHORING AND OTHER SUPPORTS

A. Mechanical systems (equipment, ductwork, piping, conduit, etc.) shall be anchored in accordance with the CBC. All systems mounted on concrete shall be secured with a concrete anchor at each mounting point. All air handlers shall be mounted on spring isolators. Secure base plate as indicated above. Attachment of equipment, ductwork, piping, conduit, etc. supported on curbs or platforms shall be made to the side of curbs and platforms, where possible. Where screws or lag bolts must be installed through the top of a sheet metal cap, the installation shall be as follows. Pre-drill pilot hole. Fill pilot hole with polyurethane sealant. Install screw or lag bolt with a flat washer and an EPDM washer adjacent to the sheet metal.

1.24 SUPPORTS AND SEISMIC RESTRAINTS

A. Any structural element required to hang or support piping, ducts or equipment provided under this Division and not shown on other drawings shall be provided under this Division.

B. Mechanical systems (equipment, ductwork, piping, etc.) shall be provided with supports and seismic restraints in accordance with the CBC.

1.25 PAINTING

A. Paint all black iron supports, hangers, anchors, etc. with two coats of rust resisting primer. Also paint all uninsulated black iron piping exposed to weather with two coats of rust resisting primer.

1.26 ROOF PENETRATIONS AND PATCHING

A. Whenever any part of the mechanical systems penetrates the roof or exterior wall, the openings shall be flashed and counter-flashed water tight with minimum 22 gauge galvanized sheet metal. Flashing shall extend not less than eight inches

from the duct, pipe, or supporting member in all directions unless detailed otherwise. All roof penetrations and patching shall be in accordance with the recommendations of the National Roofing Contractor's Association and the Owner’s roofing standards.

1.27 SYSTEM IDENTIFICATION

A. Above Grade Piping: Provide markers on piping which is either exposed or concealed in accessible spaces. For piping systems, other than drain and vent lines, indicate the fluid conveyed or its abbreviation, either by pre-printed markers or stenciled marking, and include arrows to show direction of flow. Pre-printed markers shall be the type that wrap completely around the pipe, requiring no other means of fastening such as tape, adhesive, etc. Comply with ANSI A13.1 for colors. Locate markers at ends of lines, near major branches and other interruptions including equipment in the line, where lines pass through floors, walls or ceilings or otherwise pass into inaccessible spaces, and at 50' maximum intervals along exposed portions of lines. Marking of short branches and repetitive branches for equipment connections is not required.

B. Below Grade Piping: Bury a continuous, pre-printed, bright-colored, metallic ribbon marker capable of being located with a metal detector with each underground pipe. Locate directly over buried pipe, 6” to 8” below finished grade.

C. Equipment: All equipment shall be identified with a plastic laminated, engraved nameplate which bears the unit mark number as indicated on the drawings (e.g. AC-4). Provide 1/2" high lettering - white on black background. Nameplates shall be permanently secured to the exterior of the unit.

D. Valves: Provide brass valve tags with brass hooks or chains on all valves of each piping system, excluding check valves, valves within equipment, faucets, stops and shut-off valves at fixtures and other repetitive terminal units. Prepare and submit a tagged-valve schedule, listing each valve by tag number, location and piping service. Deliver to Owner through the Engineer.

1.28 CLEANING

A. Progressively and at completion of the job, the Contractor shall thoroughly clean all of his work, removing all debris, stain and marks resulting from his work. This includes but is not limited to building surfaces, piping, equipment and ductwork, inside and out. Surfaces shall be free of dirt, grease, labels, tags, tape, rust, and all foreign material.

1.29 OPERATION AND MAINTENANCE INSTRUCTIONS

A. Printed: Three copies of Operation and Maintenance Instructions and Wiring Diagrams for all equipment and parts list for all faucets, trim, valves, etc. shall be submitted to the Engineer. All instructions shall be clearly identified by marking them with the same designation as the equipment item to which they apply (e.g. AC-3). All Wiring Diagrams shall agree with reviewed Shop Drawings and indicate the exact field installation. All instructions shall be submitted at the same time and

shall be bound in a suitable binder with tabs dividing each type of equipment (e.g. Pumps, Fans, Motors, etc.). Each binder shall be labeled indicating "Operating and Maintenance Instructions, Project Title, Contractor, Date" and shall have a Table of Contents listing all items included.

B. Verbal: The Contractor shall verbally instruct the Owner's maintenance staff in the operation and maintenance of all equipment and systems. The controls contractor shall present that portion of the instructions that apply to the control system. The Engineer's office shall be notified 48 hours prior to this meeting.

C. Acknowledgment: The Contractor shall prepare a letter indicating that all operation and maintenance instructions (printed and verbal) have been given to the Owner, to the Owner's satisfaction. This letter shall be acknowledged (signed) by the Owner and submitted to the Engineer.

1.30 RECORD DRAWINGS

A. The Contractor shall obtain one set of prints for the project, upon which a record of all construction changes shall be made. As the work progresses, the Contractor shall maintain a record of all deviations in the work from that indicated on the drawings. Final location of all underground work shall be recorded by depth from finished grade and by offset distance from permanent surface structures, i.e. building, curbs, walks. In addition, the water, gas, sewer, under floor duct, etc. within the building shall be recorded by offset distances from building walls. An electronic copy of the original drawings will be made available to the Contractor. The Contractor shall transfer the changes, notations, etc. from the marked-up prints to the electronic copy. The record drawings (marked-up prints, electronic drawings disc and a hard copy) shall be submitted to the Engineer for review.

1.31 ACCEPTANCE TESTING

A. The Contractor shall perform, document and submit all acceptance testing as required by California Code of Regulations, Title 24, Part 6.

END OF SECTION

SECTION 220001
MODULAR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Division.

1.2 CODES AND REGULATIONS

A. All work and materials shall be in accordance with rules and regulations of applicable codes cited below. Nothing in these Drawings or Specifications is to be construed to permit work not conforming to these codes. Should the Drawings or Specifications call for material or methods of construction or a higher quality or standard than required by these codes, the Drawings and Specifications shall govern. Applicable codes and regulations include, but are not necessarily limited to, the following:

California Building Code	CCR Title 24, Part 2
California Electrical Code	CCR Title 24, Part 3
California Mechanical Code	CCR Title 24, Part 4
California Plumbing Code	CCR Title 24, Part 5
California Energy Code	CCR Title 24, Part 6
California Fire Code	CCR Title 24, Part 9
Local Codes	

1.3 SCOPE

A. Included: Modular Building Manufacturer shall provide complete construction drawings for all plumbing systems for Permit Submittal to Authority Having Jurisdiction. Layout, routing and sizing of all plumbing piping, utilities and equipment above ground and below slab out to 5’ beyond building footprint shall be the responsibility of the Modular Building Manufacturer. Provide all labor, materials and services necessary for complete, lawful and operating systems as shown or noted on the drawings or as specified here. The work includes, but is not necessarily limited to, the following:

1. Sanitary sewer system.
2. Domestic water system.
3. Storm drain system (including rainwater leaders).
4. Drain system (including condensate drain).
5. All equipment as shown or noted on the drawings or as specified.

1.4 GUARANTEE

A. Guarantee shall be in accordance with the General Conditions. The Contractor shall repair any defects due to faulty materials or workmanship and pay for any resulting damage to other work which appears within the guarantee period. These Specifications may extend the period of the guarantee for certain items. Where such extensions are called for, or where items are normally provided with guarantee periods in excess of that called for in the General Conditions, the certificate of guarantee shall be furnished to the Owner through the Engineer.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Sanitary Sewer:

1. Soil, Waste and Vent Piping: Inside Building and Within Five Feet of Building Walls: Standard weight coated cast iron pipe and fittings, CISPI 301, or hub end with rubber gaskets, ASTM A74, ASTM C564. All cast iron pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute as manufactured by Tyler, AB&I or Charlotte. Heavy-duty shielded couplings, Type 304 stainless steel, with neoprene gasket, ASTM C1540. Husky HD 2000, Clamp-All 80. Mission HeavyWeight MG Couplings are also acceptable. Size 2" and smaller above grade may be standard weight galvanized steel, ASTM A120/A53, with coated cast iron recessed drainage fittings, ANSI B16.12. 2" and smaller exposed to view shall be galvanized steel, ASTM A120/A53, with coated cast iron recessed drainage fittings, ANSI B16.12.

2. Cleanouts: Comparable models of Josam, Wade or Zurn are acceptable. Floor Cleanouts: Smith 4028 with nickel bronze top in finished areas; Smith 4228 in utility areas. Wall Cleanouts: Smith 4532 with stainless steel cover and screw. Pipe Cleanouts: Iron body with threaded brass plug.

3. Cleanout Box: Precast reinforced concrete. Cast iron lid marked for service. Christy F22 in foot traffic areas; G5 in roadways.

B. Storm Drain (Including Rain Water Leader, RWL):

1. Piping: Inside Building and Within Five Feet of Building Walls: Same as Soil, Waste and Vent Piping, except as otherwise noted on drawings. Where exposed to view on exterior of building, piping shall be galvanized steel with recessed drainage fittings.

C. Water:

1. Cold Water Piping:

   a. Inside Building, Within Five Feet of Building Walls, and All Above Grade: Hard temper seamless copper, ASTM B88. Wrought copper fittings, ANSI B16.22. Type L with brazed joints (1100F, min.). 1-1/2" and smaller above grade may be soldered, 95-5 tin-antimony solder. All nipples shall be red brass (85% copper). Above grade fittings may be copper (1/2" to 2") or bronze (2-1/2" to 4") mechanically pressed fittings, ASME B16.18 or ASME B16.22. EPDM O-rings. Installation shall be in accordance with the manufacturer's installation instructions. Nibco, ProPress.

2. Hot Water Piping:

   a. Inside Building - Above Slab: Same as Cold Water Piping - Inside Building.

3. Valves and Specialties:

   a. Valves:

      1) General: Manufacturer's model numbers are listed to complete description. Equivalent models of Crane, Grinnell, Milwaukee, Nibco, Stockham or Walworth are acceptable. All valves of a particular type or for a particular service shall be by the same manufacturer. Use full port ball valve for 2" and smaller water shutoff valves; see specification below.

      2) Gate Valve: 2" and Smaller: All bronze. Rising stem. Union bonnet. Wedge disk. Malleable iron handwheel. 200 psi WOG. Stockham B-105. 2-1/2" and Larger: Iron body, bronze mounted. Non-rising stem. Wedge disk. 200 psi WOG. Flanged or AWWA hub end as applicable. Stockham G-612. Underground valves shall have square operating nut. Provide one operating "T" handle for underground valves.

      3) Check Valve: 2" and Smaller: All bronze swing check, regrinding. 200 psi WOG. Stockham B-319.

      4) Ball Valve: Full port. Bronze body, cap, stem, disk and ball. Screwed connection. Lever handle. TFE seat. O-ring seals. 300 psi WOG. Apollo, Grinnell, Jomar.

   c. Miscellaneous Specialties:

      1) Temperature and Pressure Relief Valve: ASME rated fully automatic, reseating combination temperature and pressure relief valve sized in accordance with energy input. Sensing

element immersed within upper 6" of tank. Watts.

2) Union: 2" and Smaller: AAR malleable iron, bronze to iron ground seat. 300 psi. Grinnell. Size 2-1/2" and Larger: Grooved pipe, synthetic gasket, malleable iron housing. Victaulic Style 77, Type "E" gasket, Grinnell.

3) Dielectric Coupling: Insulating union or flange rated for 250 psig. EPCO.

4) Shock Absorber: Piston type. Seamless copper chamber approved for concealed installations. Designed and applied in accordance with PDI WH201. Sioux Chief, Watts.

D. Protective Coating for Underground Piping

1. All ferrous pipe below grade (except cast iron) shall have a factory applied protective coating of extruded high density polyethylene, 35 to 70 mils total thickness, X-Tru-Coat, Scotchkote. All fittings and areas of damaged coating shall be covered with two layer double wrap of 10 mil polyvinyl tape to total thickness of 40 mils. John-Mansville. Protective coating shall be extended 6” above surrounding grade.

E. Drain Piping (including Condensate): Same as inside building cold water piping.

F. Miscellaneous Piping Items:

1. Pipe Support:

a. Pipe Hanger: Steel "J" hanger with side bolt for piping 4" and smaller; steel clevis hanger for piping 5" and larger. Load and jam nuts. Size and maximum load per manufacturer's recommendation. Felt liner for copper piping. Hanger and rod shall have galvanized finish. B-Line, Grinnell, Unistrut.

b. Isolating Shield: Galvanized steel shell and reinforcing ribs. 1/4" non-conducting hair felt pad. Pipe hanger in accordance with paragraph above. Increase hanger size per manufacturer's recommendation. B-Line, Semco, Superstrut.

c. Construction Channel: 12-gage, 1-5/8" x 1-5/8" galvanized steel channel. Single or multiple section. Self-locking nuts and fittings. B-Line, Grinnell, Unistrut.

2. Flashing: Vent flashing shall be 4 lb/ft2 lead, 16" sq. flange, length sufficient to be turned down 2" into vent. Oatey. Flashing for other piping through roof shall be prefabricated galvanized steel roof jacks with 16" sq. flange. Provide clamp-on storm collar and seal water tight with mastic. For cold process built-up roof, material shall be 4 lb/ft^2 lead instead of galvanized

steel.

2.2 PIPING INSULATION MATERIALS

A. General: All piping insulation materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50.

B. Pre-Molded Fiberglass: Heavy density sectional pre-molded fiberglass with vapor barrier laminated all service jacket and pressure sealing vapor barrier lap. Thermal conductivity shall not exceed 0.25 Btu-in/hr-ft2-F at a mean temperature of 50F. Perm rating 0.02, ASTM E96. Puncture rating 50 Beach units, ASTM D781. Provide 3" (min.) wide tape of same material as lap for butt joints. For hot water piping, thickness shall be 1" for pipe sizes 1" and less; 1-1/2" thickness for pipe sizes 1-1/4" and larger. Certainteed, Knauf, Johns-Manville, Owens-Corning.

C. Fiberglass Blanket: Unfaced. Thermal conductivity shall not exceed 0.25 Btu-in/hr-ft2-F at a mean temperature of 50F. 1-1/2" thickness. Knauf, Johns-Manville, Owens-Corning.

D. PVC Jacket (for pipe, fittings and valves): Pre-molded polyvinyl chloride (PVC) jackets, 0.020" thickness. Size to match application. Provide solvent weld adhesive and PVC vapor barrier pressure sealing tape by same manufacturer. Zeston.

E. Stretchable Glass Fabric: Reinforcing mesh. 10 X 20 continuous filament glass yarns per inch. Johns-Manville.

F. Vapor Barrier Coating: Childers CP-30, Foster 30-25.

G. Lagging Adhesive: Childers CP-50A, Foster 30-36.

H. Outdoor Mastic: Childers CP-21, Foster 65-05.

I. Insulating Tape: Ground virgin cork and synthetic elastomeric. Black, odorless, and non-toxic. K factor 0.43 Btu-in/hr-ft2-F or less. Non-shrinking. For outdoor use, provide protective finish by same manufacturer. Halstead.

J. Molded Closed Cell Vinyl (Piping Insulation Under Disabled Accessible Lavatories and Sinks): Fully molded closed cell vinyl, 3/16" thick. Internal ribs on drain insulation to provide air gap. Thermal conductivity shall not exceed 1.17 BTU-in/hr-ft^2-°F at an average temperature of 73°F. Weep hole in cleanout nut enclosure. Out of sight nylon fastening system. Hinged cap over valve to allow access for servicing. Truebro Lav-guard.

2.3 FIXTURES

A. General: Provide rough-in for and install all plumbing fixtures shown on drawings.

Except in equipment rooms, all trim, valves and piping not concealed in wall structure, above ceiling or below floors, shall be brass with polished chrome plate finish, unless noted otherwise. All enameled fixtures shall be acid resisting. Standard color is white unless otherwise noted.

B. Schedule: Refer to Plumbing Fixture Schedule on the drawings for list of fixtures and trim. Manufacturer's model numbers are listed to complete description. Equivalent models of American Standard, Eljer, Elkay, Haws, Kohler or T&S Brass are acceptable. For drainage fixtures, equivalent models of Josam, Smith or Zurn are acceptable.

C. Stops and P-Traps: All fixtures shall be provided with stops and P-Traps as applicable. Wall mounted faucets, valves, etc. shall have integral stops or wall mounted stops.

1. Stops: All hot and cold water supplies shall be 1/2" I.P.S. inlet angle stops with stuffing box, loose key lock shield, and brass riser (3/8" for 2-1/2 gpm and less, otherwise 1/2"). McGuire, Speedway.

2. P-Traps: Semi-cast brass, ground joint. 17-gage. Clean-out plug. Unobstructed waterway. California Tubular, McGuire.

2.4 EQUIPMENT

A. General Requirements:

1. Capacity: Capacities shall be in accordance with schedules shown on drawings. Capacities are to be considered minimum.

2. Dimensions: Equipment must conform to space requirements and limitations as indicated on drawings and as required for operation and maintenance. Equipment will not be accepted that does not readily conform to space conditions. Prepare and submit layout drawings for all proposed equipment (different than scheduled units) showing actual job conditions, required clearances for proper operation, maintenance, etc.

3. Ratings:

a. Electrical: Electrical equipment shall be in accordance with NEMA standards and UL or ETL listed where applicable standards have been established.

4. Piping: Each item or assembly of items shall be furnished completely piped for connection to services. Control valves and devices shall be provided. Equipment requiring domestic water for non-potable use shall be provided with backflow preventer acceptable for intended use by local governing authorities.

5. Electrical:

a. General: Each item or assembly of items shall be furnished completely wired to individual terminal blocks for connection to single branch electrical circuit. All electrical accessories and controls required by equipment shall be furnished. Provide terminal blocks for controls and interlocks not included in equipment package. Controllers and other devices shall be in NEMA 1 or 3R enclosures as applicable.

b. Wiring: Conductors, conduit, and wiring shall be in accordance with Electrical Specifications. Individual items within assembly shall be separately protected with dead front, fused disconnect, fuse block, or circuit breaker for each ungrounded conductor, all accessible on operating side of equipment. Switches, contacts and other devices shall be in ungrounded conductors.

c. Submittals: Included in shop drawings shall be internal wiring diagrams and manufacturer's recommended external wiring.

B. Water Heater: Electric. Glass lined tank with magnesium anode protection. 150 psi working pressure. Fully insulated. Automatic temperature control. High limit control. Provide ASME rated temperature and pressure relief valve sized in accordance with energy input, dielectric couplings and drain cock. UL listed. A.O. Smith, American Appliance, State Industries.

C. Circulating Pump: In-line centrifugal. Aluminum housing. All parts exposed to fluid, stainless steel. Water lubricated ceramic shaft and bearings. Epoxy encapsulated windings. Grundfos. -Or- Bronze body, brass impeller. Mechanical seals. Bronze sleeve bearings. Integral thermal overload protection. Bell and Gossett, Taco, Thrush.

D. Access Doors: Provide access doors as required where equipment, piping, valves, ductwork, etc. are not otherwise accessible. Access doors shall match the wall or ceiling finish and fire rating as indicated on the Architectural drawings. 16-gage steel frame and 14-gage steel door with paintable finish, except in ceramic tile, where door shall be 16-gage stainless steel with satin finish. Continuous hinge. Deliver doors to the General Contractor for installation. Milcor. Unless otherwise noted, the minimum sizes shall be as follows:

1 valve up to 1-1/2”	12” x 12”
1 valve up to 3”	16” x 16”

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. General:

1. Piping Layout: Piping shall be concealed in walls, above the ceilings, or below grade unless otherwise noted. Exposed piping shall run parallel to room surfaces; location to be approved by the Engineer. No structural member shall be weakened by cutting, notching, boring or otherwise, unless specifically allowed by structural drawings and/or specifications. Where such cutting is required, reinforcement shall be provided as specified or detailed. All piping shall be installed in a manner to ensure unrestricted flow, eliminate air pockets, prevent any unusual noise, and permit complete drainage of the system. All piping shall be installed to permit expansion and contraction without strain on piping or equipment. Vertical lines shall be installed to allow for building settlement without damage to piping. Pipe sizes indicated on the drawings are nominal sizes unless otherwise noted. Provide secondary drain piping where required.

2. Joints:

   a. Threaded: Pipe shall be cut square and reamed to full size. Threads shall be in accordance with ANSI B2.1. Joint compound or tape suitable for conveyed fluid shall be applied to male thread only. Joints shall be made with three threads exposed.

   b. Welded or Brazed: Filler rod shall be of suitable or the same alloy as pipe. Brazing filler metal shall have a minimum melting point of 1100F. Welding or brazing shall be performed by a Certified Welder or Brazer as certified by an organization/institution that uses standards recognized by the American Welding Society (AWS) and meets the requirements of the ASME Boiler and Pressure Vessels Code, Section 9.

   c. Open Ends: Open ends of piping shall be capped during progress of work to preclude foreign matter.

   d. Electrical Equipment: Piping shall not be run over electrical panels, motor control centers or switchboards.

3. Fittings and Valves:

   a. Standard Fittings: All joints and changes in direction shall be made with standard fittings. Close nipples shall not be used.
   b. Reducers: Pipe size reduction shall be made with bell reducer fittings. Bushings shall not be used.

   c. Unions: A union shall be installed on the leaving side of each valve, at all sides of automatic valves, at equipment connections, and elsewhere as necessary for assembly or disassembly of piping.

   d. Valves: All valves shall be full line size. Provide shut-off valve for

each building and each equipment connection. Provide shut-off valve at each point of connection to existing piping. At equipment connections, valves shall be full size of upstream piping, except that gas valves within 18" of the point of connection to the equipment may be the same size as the equipment connection.

e. Valve Accessibility: All valves shall be located so that they are easily accessible. Valves located above ceilings shall be installed within 24" of the ceiling.

4. Pipe Support:

a. General: Hangers shall be placed to support piping without strain on joints or fittings. Maximum spacing between supports shall be as specified below. Actual spacing requirements will depend on structural system. Side beam clamps shall be provided with retaining straps to secure the clamp to the opposite side of the beam. Vertical piping shall be supported with riser clamp at 20' on center (maximum). Support pipe within 12" of all changes in direction. Support individual pipes with pipe hanger. Copper piping systems which protrude through a surface for connection to a fixture stop or other outlet shall be secured with a drop ell, Grinnell No. 9788; nipple through surface shall be threaded brass.

1) Pressure Pipe:

Pipe Size (Inches)	Maximum Spacing* Between Supports (ft.)		
	Copper	Sch. 40 steel	Plastic
1/2	6	6	4
3/4	6	8	4
1	6	8	4
1-1/4	6	10	4
1-1/2	6	10	4
2	10	10	4
2-1/2	10	10	4
3	10	10	4
4	10	10	4

*Based on straight lengths of pipe with couplings only. Provide additional supports for equipment, valves or other fittings. Plastic piping shall be supported per the manufacturer's recommendations. Seismic requirements may reduce maximum spacing.

2) Gravity Drain Pipe: Piping shall be supported at each length of pipe or fitting, but in no case at greater spacing than

indicated above for pressure pipe.

b. Hot and Cold Water Piping: All hot and cold water piping shall have isolating shield; no portion of this piping shall touch the structure without an isolating shield except at anchor points for fixture rough-in.

c. Trapeze: Trapeze hangers of construction channel and pipe clamps may be used. Submit design to Engineer for review.

5. Miscellaneous:

a. Escutcheons: Provide chrome plated metal escutcheons where piping penetrates walls, ceilings, or floors in finished areas.

b. Pipe Sleeves: All piping passing through concrete shall be provided with pipe sleeves. Allow 1" annular clearance between sleeve and pipe for piping 3" and smaller, otherwise 2" annular clearance. Piping through walls below grade shall be sealed with Link-Seal.

c. Pipes Passing through Fire Rated Surfaces: Pipes passing through fire rated walls, floors, ceilings, partitions, etc. shall have the annular space surrounding the pipe or pipe insulation sealed with fire rated materials in accordance with the requirements of the fire authority having jurisdiction.

d. Dielectric Couplings: Dielectric couplings shall be installed wherever piping of dissimilar metals are joined, except that bronze valves may be installed in ferrous piping without dielectric couplings.

e. Thermometer or Pressure Gage Tap: Provide tee for instrument well. Minimum size of pipe surrounding well shall be 1-1/2".

f. Exposed Pipe at Fixtures: Piping extending from finished surfaces into a finished room shall be chrome plated brass, except under kitchen sinks in commercial kitchens.

B. Sanitary Sewer Piping:

A. General: Where inverts are not indicated, sanitary sewer piping shall be installed at 1/4" per foot pitch. Piping 4" and larger may be installed at 1/8" per foot pitch where structural or other limitations prevent installation at a greater pitch. Bell and spigot piping shall be installed with barrel on sand bed; excavate hole for bell.

B. Cleanouts: Install cleanouts at ends of lines, at changes of direction greater than 45 degrees, and at not greater than 100 foot intervals. Locate interior cleanouts in accessible locations and bring flush to finished surface.

C. Vents: Vents shall terminate not less than 6" above the roof nor less than 24" from any vertical surface nor within 10' of any outside air intake. Install horizontal vent lines at 1/4" per foot pitch. Offset vents 2' minimum from gutters, parapets, ridges and roof flashing.

C. Storm Drain (Including Rain Water Leader, RWL): Similar to Sanitary Sewer.

D. Water Piping: Connections to branches and risers shall be made from top of main. Supply header in fixture battery shall be full size to last fixture, reducing in size only on individual connections to each fixture in battery. Minimum pipe size shall be 3/4", unless otherwise noted. Exposed fixture stops and flush valves shall be installed with brass nipples for copper piping and galvanized nipples for galvanized piping. Nipples are to extend from outside of wall to fitting at header or drop behind finish wall surfaces. Pipe nipples shall be same size as stop or flush valve. Provide shut off for each building and each connection to equipment. Shock absorbers shall be installed in a vertical position per manufacturer's instructions and per PDI-WH 201 where flush valves, metering faucets or other fast acting valves are connected to the domestic piping system. Only equipment mounted on vibration isolators shall be connected with flexible connections. Underground hot water and cold water piping which run parallel to each other shall be installed a minimum of 3 feet apart.

E. Drain Piping (Including Condensate): Install with constant pitch to receptacle, 1/4" per foot where possible, otherwise 1/8" per foot minimum. Provide TEE with clean-out plug at all changes of direction. Provide trap at each air handling unit to prevent air leakage. Only equipment mounted on vibration isolators shall be connected with flexible connection. Piping not concealed in wall structure, above ceilings or below floors shall be chrome plated brass.

F. PVC Piping: Shall be cut square and assembled prior to solvent weld. Apply primer per manufacturer's recommendations. Coat male joint fully with solvent, make joint before solvent dries and wipe exterior clean.

3.2 PIPING INSULATION INSTALLATION:

A. Domestic Hot Water:

1. General: All domestic hot water piping, fittings and accessories shall be insulated.

2. Pipe: Apply pre-molded fiberglass sections to pipe using integral pressure sealing lap adhesive in accordance with manufacturer's recommendations. Stagger longitudinal joints. Seal butt joints with factory supplied pressure sealing tape.

3. Fittings and Valves:

a. Wrap all fittings and valves with pre-cut fiberglass blanket to thickness matching adjoining insulation. Cover blanket with PVC jacket in accordance with manufacturer's recommendations. Solvent weld. Seal all joints with factory supplied pressure sealing vapor barrier tape with 1-1/2" (min.) overlap on both sides of joint. Insulate valves to stem. Do not insulate unions, flanges or valves unless water temperature exceeds 140ºF or the piping is exposed to weather.

b. For miscellaneous fittings and accessories for which PVC jackets are not available or where proximity of fittings precludes a neat-appearing installation, the Contractor may cover the fiberglass blanket with stretchable glass fabric, one coat of lagging adhesive and a final coat of vapor barrier coating. All exposed ends of insulation shall be adequately sealed.

4. Additional Finish for Exposed Piping and Equipment: All piping and equipment exposed to view but protected from the weather shall be given an additional finish of PVC jackets.

B. Cold Water Piping-Freeze Protection: All cold water piping exposed to weather shall be wrapped with insulating tape, 50% overlap. Cover valves to stem. Apply at least two coats of protective finish.

C. Piping Insulation Under Disabled Accessible Lavatories and Sinks: Hot and cold water piping, hot and cold water stop and drain piping under disabled accessible lavatories and sinks shall be insulated with 3/16" thick molded closed cell vinyl to prevent accidental injury due to contact or temperature extremes. Installation shall be in accordance with manufacturer's instructions. There shall be no sharp or abrasive surfaces under disabled accessible lavatories and sinks.

3.3 FIXTURE INSTALLATION

A. Fixture Height: Shall be as indicated on Architectural drawings.

B. Floor Drains or Floor Sinks: Shall be placed parallel to room surfaces, set level, flush with floor, and adjusted to proper height to drain. Cover openings during construction to keep all foreign matter out of drain line.

C. Wall Hung Fixtures: Shall be provided with proper backing and hanger plates secured to wall. Lavatories shall be supported with concealed arm supports. Fixtures mounted on carriers shall bear against stop nuts, clear of wall surface. Caulk fixtures against walls with white G.E. "Sanitary 1700" silicone sealant. Caulking shall be smooth and flush with fixture surface (not concave).

D. Floor Mounted Fixtures: Shall be provided with proper support plates. Grout at the

floor with waterproof ceramic tile grout.

E. Other Connections: Rough-in and connection for trim or fixtures supplied by others shall be included in this specification section.

3.4 EQUIPMENT INSTALLATION

A. General: It shall be the responsibility of the equipment installer to insure that no work done under other specification sections shall in any way block, or otherwise hinder the equipment. All equipment shall be securely anchored in place.

B. Connections to Equipment: Where size changes are required for connections to equipment, they shall be made immediately adjacent to the equipment and, if possible, inside the equipment cabinet.

3.5 ACCESS TO VALVES AND EQUIPMENT

A. Access shall be possible where valves, expansion joints, fire dampers, motors, filters, control devices, and any other equipment requiring access for servicing, repairs, or maintenance are located in walls, soffits, chases, and/or above ceilings.

B. Definition of Accessible:

1. Valves and dampers may be operated.

2. Control devices may be adjusted.

3. Equipment access panels may be opened.

4. Normal maintenance work such as replacement of filters, lubrication of bearings, etc., may be performed readily within arm's reach of access opening.

5. It shall not be necessary to crawl through furred ceiling space to perform such operations.

C. Install piping, equipment and accessories to permit easy access for maintenance.

D. Group concealed valves, expansion joints, controls, dampers and equipment requiring service access, so as to be freely accessible through access doors and to minimize the number of access doors required.

E. Relocate piping equipment and accessories as required, at no extra cost to afford proper maintenance access.

F. Coordinate location of access panels with applicable trades installing walls or ceiling.

1. Coordinate panel locations with lights and other architectural features.

2. Submit proposed panel locations to Architect for review.

3.6 SYSTEM IDENTIFICATION

A. Above Grade Piping: Provide markers on piping which is either exposed or concealed in accessible spaces. For piping systems, other than drain and vent lines, indicate the fluid conveyed or its abbreviation, either by pre-printed markers or stenciled marking, and include arrows to show direction of flow. Pre-printed markers shall be the type that wrap completely around the pipe, requiring no other means of fastening such as tape, adhesive, etc. Comply with ANSI A13.1 for colors. Locate markers at ends of lines, near major branches and other interruptions including equipment in the line, where lines pass through floors, walls or ceilings or otherwise pass into inaccessible spaces, and at 50' maximum intervals along exposed portions of lines. Marking of short branches and repetitive branches for equipment connections is not required.

B. Below Grade Piping: Bury a continuous, pre-printed, bright-colored, metallic ribbon marker capable of being located with a metal detector with each underground pipe. Locate directly over buried pipe, 6” to 8” below finished grade.

C. Equipment: All equipment shall be identified with a plastic laminated, engraved nameplate which bears the unit mark number as indicated on the drawings (e.g. AC-4). Provide 1/2" high lettering - white on black background. Nameplates shall be permanently secured to the exterior of the unit.

D. Valves: Provide brass valve tags with brass hooks or chains on all valves of each piping system, excluding check valves, valves within equipment, faucets, stops and shut-off valves at fixtures and other repetitive terminal units. Prepare and submit a tagged-valve schedule, listing each valve by tag number, location and piping service. Deliver to Owner through the Engineer.

3.7 TESTS AND ADJUSTMENTS

A. General: Unless otherwise directed, tests shall be witnessed by a representative of the Engineer. Work to be concealed shall not be enclosed until prescribed tests are made. Should any work be enclosed before such tests, the Contractor shall, at his expense, uncover, test and repair all work to original conditions. Leaks and defects shown by tests shall be repaired and entire work retested. Tests may be made in sections, however, all connections between sections previously tested and new section shall be included in the new test.

B. Gravity Systems:

1. Sanitary Sewer: All ends of the sanitary sewer system shall be capped and lines filled with water to the top of the highest vent, 10' above grade

minimum. This test shall be made before any fixtures are installed. Test shall be maintained until all joints have been inspected, but no less than 2 hours.

2. Storm Drain (Including Rainwater leader): Similar to Sanitary Sewer.

3. Drains (Including Condensate): Similar to Sanitary Sewer.

C. Pressure Systems:

1. General: There shall be no drop in pressure during test except that due to ambient temperature changes. All components of system not rated for test pressure shall be isolated from system before test is made.

2. Domestic Hot and Cold Water Piping: Maintain 100 psig water pressure for 4 hours.

3.8 DISINFECTION

A. Disinfect all domestic water piping systems in accordance with AWWA Standard C651, "AWWA Standard for Disinfecting Water Mains", and in accordance with administrative authority. Disinfection process shall be performed in cooperation with health department having jurisdiction and witnessed by a representative of the Engineer. During procedure signs shall be posted at each water outlet stating, "Chlorination - Do Not Drink". After disinfection, water samples shall be collected for bacteriological analysis. Certificate of Bacteriological Purity shall be obtained and delivered to the Owner through the Engineer.

3.9 ACCEPTANCE TESTING

A. The Contractor shall perform, document and submit all acceptance testing as required by California Code of Regulations, Title 24, Part 6.

END OF SECTION

SECTION 230000
GENERAL MECHANICAL PROVISIONS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Drawings and Conditions of Contract, including General and Supplementary Conditions and Division 1 Administration Sections, apply to this Division.

1.2 PRINCIPAL WORK IN THIS SECTION

A. This section covers and applies to all work included in Divisions 20 through 25.

B. Work in this Section includes providing labor, materials, equipment, services necessary, fabrication, installation and testing for fully operational and safe systems including all necessary materials, appurtenances and features whether specified or shown in the contract documents or not, in conformity with all applicable codes and authorities having jurisdiction for the following:

1. Mechanical work covered by all sections within Divisions 20, 21, 22, 23 and 25 of the specifications, including, but not limited to:

a. Heating, ventilating and air conditioning systems and equipment.

b. Plumbing systems and equipment.

c. Control systems.

d. Testing and balancing.

C. Provide cutting and patching, for the Mechanical Work.

D. Provide piping from plumbing terminations, 10 feet from equipment, for water, gas, sanitary sewer and waste.

E. Provide drain piping for all equipment requiring drainage to floor drains, roof, sink, or funnel drains.

1.3 RELATED WORK AND REQUIREMENTS

A. Carefully check the documents of each section with those of other sections and Divisions. Ascertain the requirements of any interfacing materials or equipment being furnished and/or installed by those sections and Divisions, and provide the proper installation and/or required interface.

B. As a minimum requirement and condition, the Contractor shall provide CADD generated drawings (for the purpose of Layout Drawings, Coordinated Drawings, As-built Drawings and Record Drawings) with a proven layering standard. Deviation from this requirement shall be:

1. At the sole discretion of the Engineer.

2. Submitted as a substitution within the specified time frame.

1.4 QUALITY ASSURANCE

A. Supply all equipment and accessories in compliance with the applicable standards listed in article 1.7 of this section and with all applicable national, state and local codes.

B. All items of a given type shall be the products of the same manufacturer, unless otherwise specified herein.

1.5 SUBMITTALS

A. Submit the following items:

1. Names and qualifications of Test and Balance Agencies.

2. Name and qualifications of Controls Provider.

3. As-built Record Drawings (Submitted to Client).

4. Record Files (Submitted to Client).

5. Operating and Maintenance Manuals.

B. Items shall comply with the requirements as hereinafter specified.

1.6 SUBMITTALS – GENERAL REQUIREMENTS

A. Submit shop drawings, product data, samples and certificates of compliance required by Division 1.

B. In addition to the submittal requirements of Divisions 21, 22, 23 and 25, submit product data for the following items per the provisions of Division 20 and those of Division 1:

1. All Equipment and Fixtures indicated in Schedules on Drawings.

2. Ductwork accessories.

3. Ductwork typical construction and duct supports.

4. Duct sealing.

5. Manual and Automatic Dampers.

6. Insulation and acoustical lining.

7. Certified acoustical test performance data, for diffusers, registers, grilles and terminal air units, if specified.

8. Fan curves and sound data and motors for all fans.

9. Damper motors.

10. Controls system diagrams, materials, thermostats, humidistats, and all control devices.

11. Controls Sequence of Operations.

12. Motors and motor controllers.

C. If more than two submissions are required (initial submittal and one resubmittal) based on rejection or lack of compliance by submittal, then the Contractor shall:

1. Arrange for additional reviews by the Design Engineers.

2. Pay all costs for such additional reviews.

D. 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:

1. Confirming and correlating all quantities and dimensions.

2. Selecting fabrication processes and techniques of construction.

3. Coordinating his work with that of all other trades.

4. Performing his work in a safe and satisfactory manner.

E. Substitutions:

1. Prior to Bid shall be in accordance with Division 1.

2. After award of contract, submit separate substitution request for each substitution in accordance with the requirements hereinbelow. Support each request with:

a. Complete data substantiating compliance of proposed substitution with requirements stated in Contract documents.

b. Data relating to changes in construction schedule.

c. Any effect of substitution on other Work in this and other Divisions, and any other related contracts, and changes required in other work or products.

3. Contractor shall be responsible at no extra cost to Owner for any changes resulting from proposed substitutions which affect work of other Sections or Divisions, or related contracts.

4. Claims for additional costs caused by substitution that may subsequently become apparent shall be met by the Contractor.

5. Substitutions will not be considered for acceptance when acceptance will require

revision of Contract Documents, unless Contractor bears cost of redesign.

a. Arrange for required redesign by Engineer.

b. Pay all costs for such redesign.

c. All subject to Architect's approval.

6. Approval of substitutions shall not relieve Contractor from full compliance with requirements of Contract documents.

F. As-built (Record) Drawings:

1. Shall be in accordance with Division 1.

2. Provide after installation is complete. Final signoff and Client acceptance will not occur prior to submission of As-built drawings to Architect/Engineer.

3. Indicate as-built conditions and all revisions, fully illustrating all revisions made by all trades in the course of work.

4. Dimension physical locations of ductwork, and piping with reference elevations and distances above finished floors, below beams, from wall faces, underground (invert elevations) and from column lines.

5. Exact location, type and function of concealed valves, dampers, controllers, piping, air vents, piping drains and isolators.

6. Indicate all equipment sizes and capacities and tag numbers.

7. Provide drawing on reproducible bond.

8. These drawings shall be for as-built record purposes for the Owner’s use and are not considered shop drawings.

G. Operating Instructions, Maintenance Manuals and Parts Lists:

1. Before requesting acceptance of work, submit one set for review by Architect/Engineer.

2. After review, furnish two (2) printed and bound sets.

3. Include:

a. Installers name, address, telephone number and representatives name, and website address.

b. Manufacturer's name, model number, service manual, spare-parts list, and descriptive literature for all components, cross referenced and numbered on Record Drawings, and in accordance with Title 24 as required.

c. Maintenance instructions.

d. Listing of possible breakdown and repairs.

e. Instruction for starting, operation and programming.

f. Detailed and simplified one line, color coded flow and wiring diagram.

g. Field test report, including:

1) Instrument set points.

2) Normal operating values.

h. Name, address and phone number of contractors equipment suppliers and service agencies.

i. Assemble manufacturer's equipment manuals in chronological order, following the specification alpha-numeric system, in heavy duty 3-ring binders clearly titled on the spine and front cover with appropriate index dividers.

H. Special Tools:

1. One set of any special tools required to operate, adjust, dismantle or repair equipment furnished under any section of this Division.

2. "Special tools": those not normally found in possession of mechanics or maintenance personnel.

3. Tag each item and cross reference in Maintenance Manual.

4. Turn over to Owner's representative or temporarily secure to unit at Architect's instruction.

I. Quantity of Submittals Required:

1. Product Data (brochures):

a. Submit three (3) copies of product data.

b. Two (2) copies will be returned.

c. If comments are required, comment sheet(s) will be returned with each copy.

2. Samples:

a. Submit as required in each specification section.

1.7 REFERENCE STANDARDS

A. Reference standards of industry organizations, manufacturer associates and professional associations that publish standards of construction and/or materials that are referenced in this Division are listed in Division 1. The Standards as referenced in this Specification shall be considered as attached and binding to the requirements of the Construction Documents. The Contractor is to be considered as knowledgeable of these Standards and their requirements for the performance of the Work.

1.8 CODE COMPLIANCE

A. In addition to complying with all other legal requirements, comply with provisions of governing codes and regulations in effect during progress of the Work, and with the following:

1. Drawings and specification requirements shall govern where they exceed Code and Regulation requirements.

2. Where requirements between governing Codes and Regulations vary, the more restrictive provisions shall apply.

3. Nothing contained in Contract Documents shall be construed as authority or permission to disregard or violate legal requirements. The Contractor shall immediately draw the attention of the Architect to any such conflicts noted in the Contract Documents.

1.9 DESCRIPTION OF BID DOCUMENTS

A. General:

1. Words or phrases such as "The Contractor shall," "shall be," "furnish," provide," “connect,” "a," "an," "the," and "all" etc. may be omitted for brevity.

B. Specifications:

1. Specifications, in general, describe quality and character of materials and equipment and the Standards that govern.

2. Specifications are of simplified form and include incomplete sentences.

C. Drawings:

1. Drawings in general are diagrammatic and indicate scope, sizes, routing, locations, connections to equipment and methods of installation, but not necessarily offsets, obstructions or structural conditions. Locations on drawings may be distorted for purposes of clearness and legibility.

2. Contractor to provide additional offsets, fittings, hangers, supports, valves, drains as required for construction and coordination with work of other trades.

3. Before proceeding with work, check and verify all dimensions and carefully check space requirements with other Work to ensure that all equipment and materials can be installed in spaces allotted.

4. Assume all responsibility for fitting of materials and equipment to other parts of equipment and structure.

5. The Contractor is responsible for installing the work in such a manner that it will conform to the structure and architectural elements, avoid obstructions, maintain headroom, leave adequate clearance for proper maintenance and repairs, and provide clearances and access required by codes.

6. Make adjustments that may be necessary or requested in order to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades.

7. Above items to be performed at no additional cost to the Owner.

D. Typical details, where shown on the drawings, apply to each and every item of the project where such items are applicable. Typical details are not repeated in full on the plans, and are diagrammatic only, but with the intention that such details shall be incorporated in full.

1.10 DEFINITIONS

A. "Piping": pipe, tube, fittings, flanges, valves, controls, strainers, hangers, supports, unions, traps, drains, insulation, and related items.

B. "Motor Controllers": manual or magnetic starters (with or without switches), individual pushbuttons or hand-off-automatic (HOA) switches controlling the operation of motors.

C. "Control" or "Actuating Devices": automatic sensing and switching devices such as thermostats, pressure, float, electro-pneumatic switches and electrodes controlling operation of equipment.

1.11 JOB CONDITIONS

A. Adjoining work of other Divisions shall be examined for interferences and conditions affecting this Division.

B. Examine site related work and surfaces before starting work of any Section.

1. Report to Architect, in writing, conditions which will prevent proper provision of this work.

2. Beginning work of any Section without reporting unsuitable conditions to Architect constitutes acceptance of conditions by Contractor.

3. Perform any required removal, repair or replacement of this work caused by unsuitable conditions at no additional cost to Owner.

C. Connections to existing work.

1. Unknown conditions will be addressed if reasonable.

2. Install new work and connect to existing work with minimum interference to existing facilities.

3. Temporary shutdowns of existing services:

a. At no additional charges.

b. At times not to interfere with normal operation of existing facilities.

c. Provide 48 hour notification.

4. Maintain continuous operation of existing facilities as required with necessary temporary connections between new and existing work.

5. Restore existing disturbed work to original condition.

D. Removal and relocation of existing work.

1. Disconnect, remove or relocate material, equipment, plumbing fixtures, piping and other work noted and required by removal or changes in existing construction.

2. Where existing pipes, conduits and/or ducts which are to remain prevent installation of new work as indicated, relocate, or arrange for relocation, of existing pipes, conduits and/or ducts.

3. Provide new material and equipment required for relocated equipment.

4. Plug or cap active piping or ductwork behind or below finish.

5. Do not leave long dead-end branches. Cap or plug as close as possible to active line.

6. Remove unused piping, ductwork and material.

7. Dispose of removed fixtures and equipment as directed.

8. Turn over removed fixtures and equipment to Owner as directed.

E. Special Traffic Requirements:

1. Maintain emergency and service entrances useable to pedestrian, truck, and ambulance traffic at all times.

2. Where trenches are cut, provide adequate bridging for above-mentioned traffic.

1.12 TEMPORARY FACILITIES

A. See Division 1 for temporary facilities required.

1.13 SCHEDULE OF WORK

A. Arrange work to conform to schedule of construction established or required to comply with Contract Documents.

B. In scheduling, anticipate means of installing equipment through available openings in structure.

C. Confirm in writing to Architect, within 30 days of signing of contract, anticipated number of days required to perform test, balance, and acceptance testing of mechanical systems:

1. This phase must occur after completion of mechanical systems, including all control calibration and adjustment, and requires substantial completion of the building, including closure, ceilings, lighting, partitioning, etc.

2. Submit for approval at this time, names and qualifications of test and balancing agencies to be used.

1.14 NOISE REDUCTION

A. Cooperate in reducing objectionable noise or vibration caused by mechanical systems.

1. To extent of adjustments to specified and installed equipment and appurtenances.

B. Correct noise problems caused by failure to install work in accordance with Contract Documents. Include labor and materials required as result of such failure.

PART 2 - PRODUCTS

2.1 ACCESS DOORS

A. Size for proper access, adjusting and maintenance:

1. 12 in. x 12 in. minimum for valves, trap primers, shock absorbers, etc.

2. 24 in. x 24 in. for man access to concealed fans, coils, etc., unless indicated otherwise.

B. Provide as required by work in this Division.

C. Style, Color and Finish to match adjacent construction and as approved by Architect.

PART 3 - EXECUTION

3.1 MANUFACTURER'S RECOMMENDATIONS

A. All material, equipment, devices, etc., shall be installed in accordance with the recommendations of the manufacturer of the particular item. The Contractor shall be responsible for all installations contrary to the manufacturer's recommendations. The Contractor shall make all necessary changes and revisions to achieve such compliance. Manufacturer's installation instructions shall be delivered to and maintained at the job site

through the construction of the project.

3.2 CUTTING AND PATCHING

A. All carpentry, cutting and patching to be done under trades doing that work. Work shall be done in accordance with Division 1.

B. Provide all carpentry, cutting and patching required for proper installation of material and equipment specified in Divisions 20, 21, 22, 23 and 25.

C. Do not cut or drill structural members without consent of Architect.

D. All cutting and repairing shall conform to Title 21 of California Administrative Code.

3.3 CONCRETE ANCHORS

A. Steel bolt with expansion anchor requiring a drilled hole – powder driven anchors are not acceptable.

B. Minimum concrete embedment shall be 4-1/2 diameters.

C. Minimum spacing shall be 12 diameters center to center and 6 diameters center to edge of concrete.

D. Maximum allowable stresses for tension and shear shall be 80% of the ICBO test report values. Hilti, Phillips, Wej-It.

3.4 EQUIPMENT ANCHORING

A. All equipment shall be securely anchored in accordance with CBC.

B. All equipment mounted on concrete shall be secured with a concrete anchor as specified above at each mounting point.

C. Secure base plate as indicated above.

3.5 SUPPORTS AND SEISMIC RESTRAINTS

A. All mechanical systems (all ductwork, piping, etc.) shall be provided with supports and seismic restraints in accordance as published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), Chantilly, Virginia and in accordance with CBC.

3.6 WATER PROOFING

A. Under General Construction Work.

B. Where any work pierces waterproofing, installation shall be subject to review.

1. Provide all necessary sleeves, caulking, flashing and flashing fittings required to make openings absolutely watertight.

C. Flashing:

1. Mechanical Contractor shall provide flashing for all work in this Division, unless otherwise provided by roofing installer, as required to accommodate roof slope, roofing material, and roof installation method. No additional costs will be paid for lack of familiarity of Contractor with roofing type or slope.

2. Mechanical Contractor shall be responsible for coordinating size of penetrations and locations with roofing contractor.

3. Mechanical Contractor shall be responsible for scheduling installation of piping and other penetrations through roof structural system to exterior that they are complete and secure for the orderly installation of the roofing system.

4. 4 lb. lead.

5. 16 oz. lead coated copper.

6. No.22 USSG aluminum.

7. Fittings for piping through roof:

a. Galvanized cast iron bottom recess roof type.

b. Similar to Josam No. 26440 or No. 26450.

D. Provide weather protection canopies, hoods or enclosures over out-of-door equipment which could be damaged by exposure to weather.

1. This requirement applies to:

a. Motors and drives.

b. Controls.

c. Instruments.

2. Identify items under such covers if entirely enclosed.

3.7 ACCESS TO VALVES AND EQUIPMENT

A. Access shall be possible where valves, expansion joints, fire dampers, motors, filters, control devices, and any other equipment requiring access for servicing, repairs, or maintenance are located in walls, soffits, chases, and/or above ceilings.

B. Definition of Accessible:

1. Valves and dampers may be operated.

2. Control devices may be adjusted.

3. Fire dampers may be reset.

4. Equipment access panels may be opened.

5. Normal maintenance work such as replacement of filters, lubrication of bearings, etc., may be performed readily within arm's reach of access opening.

6. It shall not be necessary to crawl through furred ceiling space to perform such operations.

C. Install piping, equipment and accessories to permit easy access for maintenance.

D. Group concealed valves, expansion joints, controls, dampers and equipment requiring service access, so as to be freely accessible through access doors and to minimize the number of access doors required.

E. Relocate piping equipment and accessories as required, at no extra cost to afford proper maintenance access.

F. Coordinate location of access panels with applicable trades installing walls or ceiling.

1. Coordinate panel locations with lights and other architectural features.

2. Submit proposed panel locations to Architect for review.

G. Arrange for location and marking of removable tiles in splined ceilings where access panels are not installed.

H. Existing Structures:

1. When installation requires access openings through existing construction, coordinate location of necessary access panels, and arrange for respective trades to provide openings and framing which may be required.

2. Restore adjoining existing surfaces to original condition after new access panels have been installed.

3.8 SYSTEM IDENTIFICATION

A. Above Grade Piping:

1. Provide markers on piping which is either exposed or concealed in accessible spaces.

2. For piping systems, other than drain and vent lines, indicate the fluid conveyed or its abbreviation, either by pre-printed markers or stenciled marking, and include arrows to show direction of flow.

3. Pre-printed markers shall be the type that wrap completely around the pipe, requiring no other means of fastening such as tape, adhesive, etc.

4. Comply with ANSI A13.1 for colors.

5. Locate markers at ends of lines, near major branches and other interruptions

including equipment in the line, where lines pass through floors, walls or ceilings or otherwise pass into inaccessible spaces, and at 50' maximum intervals along exposed portions of lines.

6. Marking of short branches and repetitive branches for equipment connections is not required.

7. Seton or equal.

B. Below Grade Piping:

1. Bury a continuous, pre-printed, bright-colored, metallic ribbon marker capable of being located with a metal detector with each underground pipe.

2. Locate directly over buried pipe, 6” to 8” below finished grade.

C. Equipment:

1. All equipment shall be identified with a plastic laminated, engraved nameplate which bears the unit mark number as indicated on the drawings (e.g. AC-4).

2. Provide 1/2" high lettering - white on black background. Nameplates shall be permanently secured to the exterior of the unit.

D. Valves:

1. Provide brass valve tags with brass hooks or chains on all valves of each piping system, excluding check valves, valves within equipment, faucets, stops and shut-off valves at fixtures and other repetitive terminal units.

2. Prepare and submit a tagged-valve schedule, listing each valve by tag number, location and piping service.

3. Deliver to Owner through the Engineer.

3.9 CLEANING AND ADJUSTING

A. Work to be painted: Brush and clean work prior to concealing, painting and acceptance. Perform in stages if directed.

B. Painted or exposed work soiled or damaged: Clean, repair and paint to match adjoining work before final acceptance.

C. Remove debris from inside and outside of materials and equipment.

D. Flush out piping after installation.

E. Adjust valves and automatic control devices.

F. Traps, wastes and supplies: unobstructed.

3.10 FIELD QUALITY CONTROL

A. Refer to Division 1.

B. Tests:

1. Perform as specified in individual Divisions, and as required by authorities having jurisdiction.

C. Furnish written report and certification that tests have been satisfactorily completed.

D. Repair or replace defective work, as directed.

E. Pay for restoring or replacing damaged work due to tests, as directed.

F. Pay for restoring or replacing damaged work of others, due to tests, as directed.

3.11 TRAINING

A. Provide training by qualified manufacturers' representatives for equipment as specified in this Division.

B. Training to include:

1. Site-specific training.

2. Minimum hours as specified in each Section.

3. Training materials (minimum six sets).

4. Electronic media available from the manufacturer [two (2) copies].

C. Each training session to be scheduled with Owner at least 30 days in advance.

END OF SECTION

SECTION 230050
HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Division.

1.2 GENERAL MECHANICAL PROVISIONS

A. The preceding General Mechanical Provisions shall form a part of this Division with the same force and effect as though repeated here.

1.3 SCOPE

A. Included: Provide all labor, materials and services necessary for complete, lawful and operating systems as shown or noted on the drawings or as specified here. The work includes, but is not necessarily limited to, the following:

1. Air distribution system.
2. All equipment as shown or noted on the drawings or as specified.
3. System energy balance.
4. Temperature control system.
5. Refrigeration system.
6. Demolition as indicated on drawings. Where demolition is called for, remove all equipment, piping, ductwork, braces, supports, housekeeping pads, temperature controls and related items no longer required.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refrigerant Piping:

1. Piping: Hard drawn Type ACR copper, dried and capped. Wrought copper fittings, silver alloy brazed, 1100F, Silfos. Size 3/8" and smaller shall be refrigerant tube, ASTM B280.

2. Valves and Specialties:

a. Line Valve: Bronze body, ball type. TFE locked in seals. Back seated valve stem. Contromatics C-11.

b. Filter-Drier: Replaceable core. Capacity in accordance with ARI Standard 710. Sporlan "Catch-All".

c. Moisture Indicator - Sight Glass: Double port. Henry, Sporlan.

d. Vibration Isolating Connection: Seamless flexible bronze tubing, braid covered. Suitable for system pressure. American.

e. Solenoid Valve: Full line size. Sporlan.

B. Miscellaneous Piping Items:

1. Pipe Support:

a. Pipe Hanger: Steel "J" hanger with side bolt for piping 4" and smaller; steel clevis hanger for piping 5" and larger. Load and jam nuts. Size and maximum load per manufacturer's recommendations. Felt liner for copper piping. Hanger and rod shall have galvanized finish. B-Line, Grinnell, Unistrut.

b. Insulation Support: Calcium silicate insulation, 100 psi, or heavy density fiberglass, 100 psi. Insulation thickness equal to adjoining pipe insulation. Steel support shield or saddle. Provide vapor barrier for chilled water piping. Insulation and/or vapor barrier shall extend 1" beyond steel support. Pipe hanger in accordance with paragraph 1 above. Increase hanger size per manufacturer's recommendation. B-Line, Pipe Shields, Inc., Uni-Grip.

c. Isolating Shield: Galvanized steel shell and reinforcing ribs. 1/4" non-conducting hair felt pad. Pipe hanger in accordance with paragraph above. Increase hanger size per manufacturer's recommendation. B-Line, Semco.

d. Construction Channel: 12-gage, 1-5/8" x 1-5/8" galvanized steel channel. Single or multiple section. Self-locking nuts and fittings. B-Line, Grinnell, Unistrut.

C. Flashing: Flashing for piping through roof shall be prefabricated galvanized steel roof jacks with 16" square flange around pipe. Provide clamp-on storm collar and seal water tight with mastic. Maintain dielectric separation between copper and galvanized materials. For cold process built-up roof, material shall be 4 lb/ft^2 lead instead of galvanized steel.

2.2 PIPING INSULATION MATERIALS

A. General: All piping insulation materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50.

B. Aluminum Jacketing: Aluminum pipe and fitting jacketing, 0.016" thickness for straight pipe. 0.024" thickness for fittings. Integral moisture barrier. Stucco-Embossed finish. Provide pre-fabricated aluminum strapping and seals by same manufacturer. Childers.

C. Outdoor Mastic: Childers CP-21, Foster 65-05.

D. Foamed Plastic: Rubber based elastomeric preformed pipe insulation. Thermal conductivity shall not exceed 0.27 Btu-in/hr-ft^2-ºF at a mean temperature of 70ºF. 1/2" thick. Provide adhesive by same manufacturer. Armstrong Armaflex.

2.3 DUCTWORK MATERIALS

A. General: All ductwork materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50. Shall comply with 1994 UMC Standard 6-1.

B. Metal Ductwork: Metal ductwork shall be galvanized sheet steel, lock forming quality, ASTM A-653, with gauge and construction to match SMACNA Standard for pressure required (26 gauge minimum).

C. Flexible Ductwork: Insulated flexible ductwork. One pound per cubic foot glass fiber insulation, 1" thick where ductwork is within the building thermal insulation envelope, 1-1/2" thick where ductwork is outside the building thermal insulation envelope. Thermal conductivity shall not exceed 0.25 Btu-in/hr- ft^2-ºF at a mean temperature of 75ºF. Seamless vapor barrier jacket. Duct shall comply with NFPA 90A. Genflex, Wiremold. Duct Static Pressures of 1.0" W.C. and less: Continuous internal liner bonded to galvanized steel wire helix. Duct shall be capable of continuous operation at 1-1/2" of water static pressure and 4,000 ft/min air velocity. Duct Static Pressures Greater than 1.0" W.C.: Continuous internal liner bonded between a dual galvanized steel wire helix. Duct shall be capable of continuous operation at 3" of water static pressure and 5,500 ft/min air velocity.

D. Duct Sealants: All Joints Exposed to Weather: Sealant shall be G.E. "Silglaze II" silicone or Hardcast CCWI-181. Joints Not Exposed to Weather (Except Spiral Wound and Greater than 2" Pressure Class): Water-based duct sealant, without substitution. 'Uni-Mastic 181' by McGill Airseal or Design Polymetrics DP-1010. Spiral Wound Joints Not Exposed to Weather and All Joints on Greater than 2" Pressure Class: Sealant shall be Eco-Duct Seal 44-60, or United Duct Sealer.

E. Spiral Wound Metal Ductwork: Spiral wound factory fabricated galvanized steel, gages in accordance with the UMC. All fittings shall be factory fabricated with all seams fully welded. Tees and laterals shall be conical type. Connections to plenums shall be with bell-mouth fittings. 8" and smaller ells shall be two-piece die-stamped. Ells larger than 8" shall be five pieces. United McGill. Shop fabricated fittings are not acceptable.

2.4 AIR TERMINALS AND DUCT FITTINGS

A. Grilles: (Grilles, Registers, Diffusers and Louvers)

1. Information on Drawings: Refer to Grille Schedule on the drawings for the list of grilles. Manufacturer's model numbers are listed to complete the description. Equivalent models of Titus, Price, or Krueger are acceptable. Manufacturer’s facilities must include a testing lab. Refer to the floor plans for neck size, CFM, air diffusion pattern and fire damper, if required.

2. Performance: Submit complete performance data (throw, pressure drop, noise level, etc.) for all grilles proposed, other than those scheduled. Testing shall be in accordance with ANSI/ASHRAE 70-1991. If, according to the certified data of the manufacturer of the proposed units, the sizes indicated on the drawings will not perform satisfactorily, the units shall be reselected by the Contractor for the proper diffusion, spread, pressure drop, throw and noise level.

3. Frame and Accessories: All supply, return, and exhaust grilles shall have an opposed blade volume control damper unless otherwise noted. All surface mounted grilles shall have a perimeter gasket and flanged edge. All grilles shall have frames suitable for mounting in the surfaces designated by the architectural drawings. Key or screwdriver operated, no slide bars.

4. Finish: All ceiling and wall grilles and all louvers shall have a paintable white finish unless otherwise noted. Interior components (everything behind the face plate) shall be flat black. Floor grilles shall have an anodized aluminum finish unless otherwise noted.

B. Branch Duct Volume Damper: Volume control damper (VCD) in rectangular ducts shall be as follows: Opposed blade, 6" maximum blade width, 16-gage blade, 48" maximum length, nylon or oil impregnated bronze bearings, 1/2" shaft, 16-gage channel frame, actuating rod and linkage out of air stream. VCD in round duct shall be as follows: Damper blade full height of branch and 1" less than branch width. All branch dampers shall have regulator with stamped steel handle, spring loaded shaft nut, cast body and serrated self-locking die cast core. Secure a 12" length of orange or yellow colored plastic ribbon to handle for ease of location. Where rectangular or round ductwork is insulated, provide elevated dial regulator. Ventlok 641 (with 607 end bearing for round ducts) for non-insulated ducts.

C. Extractor: Curved blade turns in adjustable position rigid frame. Tuttle and Bailey Deflectrol.

D. Turning Vanes: Double wall, hollow metal, air foil shape. Spacing in accordance with manufacturer's recommendations. Aero Dyne HEP.

E. Flexible Connection: UL listed neoprene coated 30-ounce fiberglass cloth. 3" metal, 3" fabric, 3" metal. Ventglas.

F. Fire and Combination Fire/Smoke Damper: California State Fire Marshal approved. UL listed. Hour rating as required by the rating of the wall, ceiling, floor, etc. in which it is installed. All ceiling fire dampers shall be Leakage Class II. Combination fire/smoke dampers shall have normally-closed, non-stall factory electric actuator rated for 250ºF (min.) and shall be Leakage Class II.

G. Duct Access Door: Insulated double wall door. Full piano hinge. Cam latch. Pressure rating to match application. Air Balance.

H. Relief Vent: Factory fabricated, curb mounted gravity relief vent. Galvanized steel or aluminum. Throat area as indicated on drawings. Outlet area equal or greater than throat area. 1/2" birdscreen. Provide backdraft damper as specified elsewhere. Cook, Penn, Greenheck.

I. Back Draft Damper: Aluminum interlinked blades. Aluminum or galvanized steel frame. Bronze bearings. Counter balanced for full closing. Arrow, Wonder Metal.

2.5 DUCTWORK INSULATION MATERIALS

A. General: All ductwork insulation materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50.

B. Fiberglass Blanket: Thermal conductivity shall not exceed 0.27 Btu-in/hr-ft^2-ºF at a mean temperature of 75ºF. 3/4 lb/ft^3, 1-1/2" thick where ductwork is within the building thermal insulation envelope. 1 lb/ft^3, 1-1/2" thick where ductwork is outside the building thermal insulation envelope, but below the roof. 1 lb/ft^3, 2" thick where ductwork is outside and/or above the roof. Faced with glass reinforced foil laminated to Kraft paper. Certainteed, Knauf, Johns-Manville, Owens-Corning.

C. Fiberglass Board: Same properties as fiberglass blanket except that density shall be 3 lb/ft^3 (minimum) and foil facing is not required.

D. Acoustic Lining: Glass fiber. Thermal conductivity shall not exceed 0.28 Btu-in/hr-ft^2-ºF at a mean temperature of 75ºF. One side coated to prevent fiber erosion up to 6000 ft/min. Average noise reduction coefficient of 0.80. 1.5 lb/ft^3 density. 1" thick where ductwork is within the building thermal insulation envelope. 1-1/2" thick where ductwork is outside the building thermal insulation envelope, but below the roof. 2" thick where ductwork is outside and/or above the roof.

Certainteed, Knauf, Johns-Manville, Owens-Corning.

E. Bonding Adhesive: Foster 85-60.

2.6 EQUIPMENT

A. General Requirements:

1. Capacity: Capacities shall be in accordance with schedules shown on drawings. Capacities are to be considered minimum.

2. Dimensions: Equipment must conform to space requirements and limitations as indicated on drawings and as required for operation and maintenance. Where Architectural screening is indicated, equipment shall not extend above or beyond screening. Equipment will not be accepted that does not readily conform to space conditions. Prepare and submit layout drawings for all proposed equipment (different than scheduled units) showing actual job conditions, required clearances for proper operation, maintenance, etc.

3. Ratings:

a. Gas: Gas burning equipment shall be furnished with 100% safety gas shut-off, intermittent pilot ignition, and be approved by AGA, except that boilers shall be AGA approved or UL listed.

b. Electrical: Electrical equipment shall be in accordance with NEMA Standards and UL or ETL listed where applicable standards have been established.

4. Piping: Each item or assembly of items shall be furnished completely piped for connection to services. Control valves and devices shall be provided. Equipment requiring domestic water for non-potable use shall be provided with backflow preventer acceptable for intended use by local governing authorities.

5. Electrical:

a. General: Each item or assembly of items shall be furnished completely wired to individual terminal blocks for connection to single branch electrical circuit. All electrical accessories required by equipment shall be furnished. Provide terminal blocks for controls and interlocks not included in equipment package. Manual and magnetic starters shall have ambient compensating running overcurrent protection in all ungrounded conductors. Magnetic starters shall be manual reset, shall have H-O-A switches and auxiliary contacts. Controllers and other devices shall be in NEMA 1 or 3R enclosures as applicable.

b. Wiring: Conductors, conduit, and wiring shall be in accordance with Electrical Specifications. Individual items within assembly shall be separately protected with dead front, fused disconnect, fuse block, or circuit breaker for each ungrounded conductor, all accessible on operating side of equipment. Switches, contacts and other devices shall be in ungrounded conductors.

c. Motors: Shall be rated, constructed and applied in accordance with NEMA and ANSI Standards without using service factor. Single-phase motor shall be of type to suit application. Three-phase motors shall be open drip proof, NEMA B design on pumps and fans, NEMA C on reciprocating equipment, sealed ball bearing, three-phase induction unless otherwise noted. Design shall limit starting inrush current and running current to values shown on drawings. Motors from 1 horsepower to 5 horsepower shall be the standard high efficiency type, Magnetek E-Plus. Motors for use with VFD's and motors 7-1/2 horsepower and larger shall be the premium efficiency type, tested according to IEEE Standard 112, Method B. Magnetek E-Plus III. Motors exposed to weather shall be TEFC. Motors in a fan air stream shall be TEFC or TEAO. Vertical motors outdoors shall be ODP or TEFC and shall have rain caps.

d. Starters: Motor starters shall be furnished for all equipment except where starter is in a motor control center as designated on the electrical drawings. Deliver starter to Electrical Contractor for installation and wiring.

e. Control Voltage: Equipment connected to greater than 240 volts shall be provided with 120 volt control circuit from integral protected transformer if separate source is not indicated on plans. 240 volt control is acceptable if confined within control panel.

f. Submittals: Included in shop drawings shall be internal wiring diagrams and manufacturer's recommended external wiring.

6. Fan Selection:

a. Fan Curves: Performance curves shall be submitted for all units of 3000 CFM or greater. Operating point for forward curved fans shall be from point of maximum efficiency toward increased CFM limited by horsepower scheduled. Operating point for backward inclined fans shall be selected near point of maximum efficiency. Curves shall plot CFM verses static pressure with constant brake horsepower, RPM and efficiency lines.

b. Static Pressure: Unless otherwise noted, pressure scheduled as external static pressure (ESP) includes all ductwork and accessory losses external to the unit housing. Unless otherwise noted,

pressure scheduled as total static pressure includes all ductwork, filter, coil, cabinet, damper and other accessory losses. Unless otherwise noted, pressure scheduled as duct static pressure includes all supply and return ductwork and accessory losses external to the unit housing and plenum (as applicable). The allowance for filter losses is 0.3" WC, unless otherwise noted. Submit itemized static pressure losses for all components.

7. Filters:

   a. General: Tested and rated in accordance with ASHRAE Standard 52 - 92 and SFM 12-71-1, Part 12, Title 24, C.C.R. Furnish and install one complete change of all filters after air balance is completed and prior to acceptance. Provide pressure differential gage across all filter banks, except at air conditioning units.

   b. Filter Media: 2" media. Weight arrestance 90%. Dust spot efficiency 25%. Clean filter resistance 0.10" water at 300 fpm. Throw-away frame. Class 2. Farr. Minimum Efficiency: MERV-13.

   c. Replaceable Filter Media: Weight arrestance 80%. Clean filter resistance 0.08" W.C. at 300 fpm. Class 2. Renewable. Thickness as listed below. Minimum Efficiency: MERV-13.

   d. Permanent Filter Frame: 18 gage galvanized "U" channel. 14 gage 2" x 2" mesh welded and galvanized wire back grid. 10 gage hinged galvanized wire front support gate with media holding prongs. 2" thick filters for air handling and air conditioning units. 1" thick filters for unit ventilators and fan coil units. Minimum Efficiency: MERV-13.

8. Screens: All duct or louver openings to the outside shall be covered with 1/2", 16-gage, galvanized wire mesh screen.

9. Sound Ratings: Shall be in accordance with ASHRAE 36 - 72.

10. Drives: Unless noted as direct connected, drives shall be V-belt, rated at 150% of motor horsepower. Multiple drive belts shall be matched set. Drive sheaves shall be dynamically balanced, adjustable, range +/- 10%, selected at mid range. Adjustable relative movement shall be lockable to shaft. Belts shall be aligned within 1-1/2 degrees at all times. Open drives shall be provided with OSHA approved open mesh belt guards. Belt guards exposed to weather shall be weatherproof enclosure with louvered face for adequate ventilation. Driving motor shall be mounted on adjustable rails. T.B. Woods, Browning. Submit RPM range of driven machine with drive selection.

11. N/A

12. Coils:

a. Construction: Copper tube. Copper or aluminum 0.0075" min. thickness fins hydraulically or mechanically bonded to tube. 16-gage galvanized steel rigid channel coil casing. Rated working pressure 200 psig min. All coils shall have connections at the same end.

b. Capacity: Ratings certified by ARI in accordance with ARI Standard 410. Cooling coil face velocity shall not exceed manufacturer's published ratings or 600 fpm. Heating coil face velocity shall not exceed 1000 fpm. Include coil selection calculations in shop drawings.

B. Air Conditioning Unit:

1. Warranty:

a. Provide parts warranty (excluding refrigerant) for one year from start-up or 18 months from shipment, whichever occurs first.

b. Provide five-year extended warranty for compressors.

c. Provide ten-year heat exchanger limited warranty.

2. Approved Manufacturers:

a. Carrier, Trane, Daikin.

b. Substitutions: As indicated under Section 012500 of these specifications. Mechanical contractor shall be responsible for electrical, mechanical, and changes to the structure when using a product other than the specified product. As built drawing changes are the responsibility of the mechanical contractor.

3. General Unit Description:

a. Unit(s) furnished and installed shall be combination heating and cooling or cooling only packaged rooftop(s) as scheduled on contract documents and these specifications. Cooling capacity ratings shall be in accordance with AHRI testing procedures. Unit(s) shall consist of insulated weather-tight casing with compressor(s), air-cooled condenser coil, condenser fans,

evaporator coil, return-air filters, supply motors and unit controls and drives.

a. Unit(s) shall be 100% factory run tested and fully charged with R-410A.

b. Unit(s) shall have labels, decals, and/or tags to aid in the service of the unit and indicate caution areas.

c. Units shall be convertible airflow design as manufactured.

d. Wiring internal to the unit shall be colored and numbered for identification.

4. Unit Casing:

a. Cabinet: Zinc coated galvanized steel, phosphatized, and finished with a weather resistant baked enamel coating with removable access panels. Structural members shall be 18 gauge with access doors and removable panels of minimum 20 gauge.

b. Units cabinet surface shall be tested 1000 hours in salt spray test in compliance with ASTM B117.

c. Cabinet construction shall allow for all service/ maintenance from one side of the unit.

d. Cabinet top cover shall be one piece construction or where seams exits, it shall be double-hemmed and gasket-sealed.

e. Access Panels: Water- and air-tight panels with handles shall provide access to filters, heating section, return air fan section, supply air fan section, evaporator coil section, and unit control section.

f. Units base pan shall have a raised 1-1/8-inch high lip around the supply and return openings for water integrity.

g. Insulation: Provide ½-inch thick fiberglass insulation with foil face on all exterior panels in contact with the return and conditioned air stream. All edges must be captured so that there is no insulation exposed in the air stream.

h. Provide openings either on side of unit or through the base for power, control, condensate, and gas connections.

i. The base of the unit shall have 3 sides for forklift provisions. The base of the units shall have rigging/lifting holes for crane maneuvering.

5. Air Filters:

    a. Air Filters: Factory installed filters shall mount integral within the unit and shall be accessible through access panels. Clean set up 2-inch MERV 13 filters shall be installed in unit prior to acceptance of building by owner.

6. Fans and Motors:

    a. Provide evaporator fan section with forward curved, double width, double inlet, centrifugal type fan.

    b. Provide self-aligning, grease lubricated, ball or sleeve bearings with permanent lubrication fittings.

    c. Unless otherwise indicated on drawing schedule, provide units with belt driven supply fans with adjustable motor sheaves.

    d. Outdoor and Indoor Fan motors shall be permanently lubricated and have internal thermal overload protection.

    e. Outdoor fans shall be direct drive, statically and dynamically balanced, draw through in the vertical discharge position.

    f. Provide shafts constructed of solid hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.

7. Evaporator Coil:

    a. Provide configured aluminum fin surface mechanically bonded to copper tubing coil.

    b. Provide factory installed thermal expansion valve (TXV) for each refrigerant circuit. Factory pressure tested at 600 psig and assembled unit leak tested at 465 psig.

    c. Provide a removable, reversible, cleanable double sloped drain pan for base of evaporator coil constructed of PVC.

8. Condenser Section:

    a. Provide internally finned seamless copper tube mechanically bonded to configured aluminum fins. Factory pressure tested to 600 psig and assembled unit leak tested at 465 psig.

    b. Provide vertical discharge, direct drive fans with aluminum blades. Fans shall be statically balanced. Motors shall be permanently lubricated, with integral thermal overload protection in a weather

tight casing.

c. Provide factory coil guards for condenser section.

10. Refrigeration System:

a. Compressor(s): Provide scroll compressor with direct drive operating at 3600 rpm. Integral centrifugal oil pump. Provide suction gas cooled motor with winding temperature limits and compressor overloads.

b. When indicated on drawing schedule, units shall have cooling capabilities down to 0 degree F. For field-installed low ambient accessory, the manufacturer shall provide a factory-authorized service technician that shall assure proper installation and operation.

c. Provide each unit with one refrigerant circuit(s) factory-supplied completely piped with liquid line filter-drier, suction and liquid line pressure ports.

d. For heat pump units, provide reversing valve, discharge muffler, flow control check valve, and electronic adaptive demand defrost control on all units.

11. Outside Air Section – Fully Modulating:

a. Provide a fully integrated field-installed 100% modulating outside air economizer with unit return and barometric relief air dampers, minimum position setting, preset linkage, wiring harness with plug. Unit operation is through primary temperature controls that automatically modulate dampers to maintain space temperature conditions.

b. Provide economizer with dry bulb control only.

c. Provide adjustable minimum position control located in the economizer section of the unit.

d. Provide spring return motor for outside air damper closure during unit shutdown or power interruption.

12. Operating Controls:

a. Provide factory-wired roof top units with 24-volt electro-mechanical control circuit with control transformers, contactors pressure lugs or terminal block for power wiring. Units shall have single point power connection as standard. Field wiring of zone controls to be CEC Class II.

b. Provide factory-installed indoor evaporator defrost control to prevent compressor slugging by interrupting compressor operation.

c. Provide an anti-cycle timing and minimum on/off between stages timing in the microprocessor.

d. Economizer Preferred Cooling (if supplied with economizer) - Compressor operation is integrated with economizer cycle to allow mechanical cooling when economizer is not adequate to satisfy zone requirements. Compressors are enabled if space temperature is recovering to cooling setpoint at a rate of less than 0.2 degrees per minute. Compressor low ambient lockout overrides this function.

13. Roof Curb:

a. Contractor shall provide calculated roof curb stamped by Structural Engineer licensed in the state of California, made of heavy gauge steel with supply and return air gasketing and wood nailer strips. Curb shall be sloped to match slope of roof. Provide hold-down clips.

C. Exhaust Fan:

1. General: All exhaust fans shall be tested according to AMCA Standard 210 in an AMCA registered laboratory. Fans exposed to weather shall have ventilated weatherproof housing over motor and drive assembly. Refer to Paragraph 2.6A for general requirements. All direct drive fans shall be provided with unit mounted speed controllers, unless otherwise noted. All motors 1 horsepower and larger shall be the high efficiency type.

2. Ceiling Fan: Ceiling mounted direct drive centrifugal exhaust fan with exhaust grille. Motor mounted in rubber-in-shear isolators. Motor and fan removable through grille. Acoustically lined housing. Backdraft damper. UL listed. Acme, Carnes, Cook, Greenheck, Penn.

3. Roof Fan: Multivane centrifugal fan. Ball bearings. Vibration isolating mount. All aluminum construction with steel or aluminum wheel. Factory curb. Backdraft damper. Birdscreen. Dome type or up-blast type as indicated on drawings. Range hood fans shall be in accordance with UL 762. Acme, Carnes, Cook, Greenheck, Penn.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. General:

1. Piping Layout: Piping shall be concealed in walls, above the ceilings, or below grade unless otherwise noted. Exposed piping shall run parallel to room surfaces; location to be approved by Architect. No structural member shall be weakened by cutting, notching, boring or otherwise, unless specifically allowed by structural drawings and/or specifications. Where such cutting is required, reinforcement shall be provided as specified or detailed. All piping shall be installed to permit expansion and contraction without strain on piping or equipment.

2. Pipe Support:

a. General: Hangers shall be placed to support piping without strain on joints or fittings. Maximum spacing between supports shall be as specified below. Actual spacing requirements will depend on structural system. Refer to drawings for additional requirements and attachment to structure. Side beam clamps shall be provided with retaining straps to secure the clamp to the opposite side of the beam. Vertical piping shall be supported with riser clamp at 20' on center (maximum). Support pipe within 12" of all changes in direction.

Pipe Size (In.)	Maximum Spacing Between Supports (Ft.)*		
	Copper	Sch. 40 Steel	Plastic
½	6	6	4
¾	6	8	4
1	6	8	4
1 ¼	6	8	4
1 ½	6	10	4
2	10	10	4
2 ½	10	10	4
3	10	10	4
4	10	10	4
6	10	10	4
8	10	10	4

*Based on straight lengths of pipe with couplings only. Provide additional supports for equipment, valves or other fittings. Plastic piping shall be supported per the manufacturer's recommendations. Seismic requirements may reduce maximum spacing.

b. Refrigerant Piping: Support insulated refrigerant line with construction channel and sheet metal support saddle. 5' spacing. Use isolation shield for uninsulated pipe. When using pre-charged tubing, all changes of direction shall be made with bending tools producing neat uniform bends. Free hand bends will not be accepted.

5. Miscellaneous:

a. Escutcheons: Provide chrome plated escutcheons where piping penetrates walls, ceilings, or floors in finished areas.

b. Pipe Sleeves: All piping passing through concrete shall be provided with pipe sleeves. Allow 1" (nominal) clearance between sleeve and pipe or pipe insulation. Piping through walls below grade shall be sealed with Link-Seal.

c. Pipes Passing through Fire Rated Surfaces: Pipes passing through fire rated walls, floors, ceilings, partitions, etc. shall have the annular space surrounding the pipe or pipe insulation sealed with fire rated materials in accordance with the requirements of the fire authority having jurisdiction.

B. Condensate Drain Piping: Install with constant pitch to receptacle. 1/4" per foot where possible, otherwise 1/8" per foot minimum. Provide TEE with cleanout plug at all changes of direction. Provide trap at each air handling unit to prevent air leakage. Connections to equipment mounted on vibration isolators shall be made with flexible connection. Except in equipment rooms, piping not concealed in wall structure, above ceilings or below floors shall be chrome plated brass.

C. Refrigerant Piping: Pipe shall be cut square. Joint surfaces shall be thoroughly cleaned, fitted and erected before brazing. Provide traps in vertical sections of piping every 10’ or at each floor, whichever is less. After installation, evacuate to 29 inches of mercury, ambient temperature during evacuation shall not be less than 70ºF. After evacuation, fill with dry nitrogen to 250 psi and maintain for two-hour period without additional charge. After nitrogen test, purge with refrigerant charged through dryer and maintain holding charge in system and equipment. Refrigerant piping below grade shall be run in 4" (min.) PVC conduit with long radius ells. Seal ends of conduit watertight.

D. Flue Piping: Flue piping shall be installed in accordance with its UL listing and the manufacturer's instructions.

3.2 PIPING INSULATION INSTALLATION

A. Refrigerant Piping: Cover suction piping with foamed plastic insulation. Longitudinal and end seams shall be thoroughly cemented with adhesive in accordance with manufacturer's recommendations. Cover all fittings, unions, valves and connections. Piping exposed to weather shall be covered with aluminum jacketing, seal all joints with outdoor mastic.

3.3 DUCTWORK INSTALLATION

A. General:

1. Standards: Unless otherwise noted, all ductwork shall be constructed and installed in accordance with current SMACNA Standards. Ductwork shall be built to a pressure classification equal to or greater than the maximum operating pressure at that point in the ductwork. A copy of these standards shall be maintained at the job site at all times. Duct work and accessories shall be installed in a manner to prevent vibration and rattling.

2. Access: Provide duct access doors as required to adjust equipment and dampers. Provide wall or ceiling access panels, or remote actuators as required where equipment and dampers are not otherwise accessible. Ventlok 666 concealed remote actuator with zinc finish on cover.

3. Flexible Connections: Connection of ductwork to any vibrating equipment shall be with 3" (min.) flexible connection. Install with ample slack and uniform gap. There shall be no metal to metal contact across flexible connection. Flexible connections exposed to weather shall have a protective sheet metal cover.

4. Flanges and Escutcheon: Where ductwork penetrates walls, ceilings, or floors, furnish and install flange or escutcheon of same material as duct.

B. Low Velocity-Low Pressure (up to 2,000 ft/min and up to 2.0 in water):

1. Sheet Metal Ductwork:

a. Ells: Ells with less than standard radius and square ells shall be fitted with turning vanes.

b. Tees: Tees in supply ductwork shall be straight tap-in with extractor or 45 degree take-off as shown on drawings. Grilles or branches in supply ductwork shall be a minimum of 8 duct diameters downstream of tees.

c. Duct Joints and Seams: All joints and seams, including spiral wound metal ductwork which are not exposed to weather shall be

sealed airtight with water-based duct sealant, ‘Uni-Mastic 181’ by McGill Airseal. All joints and seams exposed to weather shall be sealed air and water tight with G.E. "Silglaze II" silicone sealant. (See Part 2 of this Specification).

d. Dampers: Install volume control damper and damper regulator in all branch ducts.

2. Flexible Glass Fiber Ductwork: The use of flexible duct is limited to the last 5 feet of each branch duct (i.e. one 7 foot section of flexible duct may be used to connect the grille to the sheet metal branch duct). No joints are permitted in this 5' length. Hangers shall be 4" wide metal straps spaced to prevent sagging, 42" spacing maximum. Insert 6" wide fiberglass pad between duct and hanging strap. Joints shall be installed with stainless steel or nylon draw bands, Duro Dyne Dyn-O-Tie. Minimum turn radius shall be in accordance with SMACNA Standards (turn radius of duct centerline not less than 1.5 times the duct diameter).

3. Spiral Wound Metal Ductwork: Provide in all areas where ductwork is exposed to view, unless otherwise noted. At side duct grilles, the grille shall be cut directly into the spiral duct. Duct to duct joints shall be made with the spiral seam rotated so that the seam forms a continuous helical pattern across the joint.

4. Moisture Bearing Exhaust Ductwork: Exhaust ductwork bearing moisture such as exhaust ducts from showers, dishwashers, clothes driers, etc. shall be constructed of 18 gage stainless steel made liquid tight with continuous external weld for all seams and joints. Provide neoprene gaskets at flanged connections. Unless otherwise indicated, the ducts shall slope down towards the source of moisture (grille, hood, drier, etc.). Where ducts are not self daining back to the equipment, provide low point drain pocket with copper drain to sanitary sewer. Provide access door in side of duct at drain pockets. Sheet metal screws or any other device that protrudes into the duct shall not be used for clothes drier exhaust ducts.

C. High Velocity - Medium or High Pressure (over 2,000 ft/min or over 2.0 in water):

1. Sheet Metal Ductwork:

a. Duct Joints: All joints shall be sealed airtight with duct sealant.

b. Ells: Ells with less than standard radius and square ells shall be fitted with turning vanes.

c. Tees: Tees in supply ductwork shall be straight tap-in with extractor or 45 degree take-off as shown on drawings. Grilles or branches in supply ductwork shall be a minimum of 8 duct diameters downstream of tees.

d. Dampers: No dampers shall be installed in medium or high pressure ductwork.

e. Hangers: Ducts shall not be penetrated with hanger fasteners such as screws, bolts, rivets, etc.

2. Flexible Glass Fiber Ductwork: Maximum allowable length is 5 feet; no joints are permitted in this length. Hangers shall be 4" wide metal straps spaced to prevent sagging, 42" spacing maximum. Insert 6" wide fiberglass pad between duct and hanging straps. Joints shall be installed with a 3" (min.) overlap, sealed with duct sealant, and secured with a 1" wide, 18-gage galvanized sheet metal strap with 1/4" bolt fastener. Minimum turn radius shall be in accordance with SMACNA Standards (turn radius of duct centerline not less than 1.5 times the duct diameter).

3.4 AIR TERMINALS AND DUCT FITTINGS INSTALLATION

A. General: Unless otherwise noted, all air terminals and duct fittings shall be installed in accordance with current SMACNA Standards. Terminals and fittings shall be installed in a manner to prevent vibration and rattling. Metal surfaces exposed to view behind grilles and registers shall be painted flat black.

B. Fire and Combination Fire/Smoke Damper: Shall be installed in accordance with the manufacturer's recommendations. Provide access doors as required. Manufacturer's instructions shall be available to the inspecting authorities. Shall be tested according to State Fire Marshal requirements.

3.5 DUCTWORK INSULATION INSTALLATION

A. General: Insulate all sheet metal supply and return ductwork except as noted below. Acoustically line all exhaust ductwork within 10 feet of exhaust fans. Insulation shall be continuous through walls and floors except at fire dampers.

B. Where Insulation Is Not Required: Do not insulate factory-insulated ducts or casings, acoustic lined ducts, fibrous glass ducts, underground ductwork, supply or return ductwork exposed to view in the space that it serves, or exhaust ductwork, except as noted.

C. Concealed Ductwork: Wrap concealed ductwork with fiberglass blanket lapped 2" minimum. Secure with staples 4" on centers maximum on straight runs and 3" maximum at elbows and fittings. Insulation on bottom of ducts wider than 36" shall also be secured with mechanical fasteners at 24" on center.

D. Acoustic Lining: Unless otherwise indicated, all supply and return ductwork in equipment rooms including outside air intakes, all ductwork exposed to weather and other ducts as indicated on drawings, shall have acoustic lining. Do not acoustic line evaporative cooling ductwork or ductwork downstream of high

efficiency filters. Where acoustic lining is installed, increase each sheet metal dimension to accommodate lining and maintain clear inside duct dimensions shown on drawings. Apply lining with bonding adhesive in accordance with manufacturer's recommendations and also secure with mechanical fasteners in accordance with SMACNA Standards. Seal exposed edges of lining with bonding adhesive.

E. Exposed Ductwork: All externally insulated ductwork which is exposed to view but protected from the weather shall be insulated with fiberglass board. Secure with mechanical fasteners at 12" on center. Reinforce all edges with corner angles and apply a finish coat of canvas or stretchable glass fabric and lagging adhesive.

F. Ductwork Exposed to Weather and Externally Insulated: Ductwork which is exposed to weather, but not internally insulated such as ductwork downstream of high efficiency filters or ductwork on combination evaporative cooled and heated air systems shall be externally insulated with 2" fiberglass board. The fiberglass board shall then be protected with a galvanized sheet metal jacket per SMACNA standards.

3.6 EQUIPMENT INSTALLATION

A. General: It shall be the responsibility of the equipment installer to ensure that no work done under other specification sections shall in any way block or otherwise hinder the equipment. All equipment shall be securely anchored in place. All equipment shall be installed level.

B. Air Conditioning Units:

1. Contractor shall verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.

2. Contractor shall verify that proper power supply is available.

3. Contractor shall install in accordance with manufacturer’s instructions.

4. Mount units providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

C. Connections to Equipment: Where size changes are required for connections to equipment, they shall be made immediately adjacent to the equipment and, if possible, inside the equipment cabinet.

D. Unit Ventilators and Fan Coils: Supply and return piping in unit ventilator and fan coil end compartments shall be full branch line size to shut off valves. Shut off valves and coil piping may be reduced to scheduled size. Branch line reduction to shut off valves shall be made within 3" of shut off valves. One typical unit of each type shall be piped for review by the Engineer before piping the remaining units.

E. Equipment Platforms: Unless otherwise noted, shall be as shown on drawings and as follows: Flashing and platform cover shall be 22 gage (min.) sheet metal. All joints and seams shall be soldered with 2" (min.) overlaps. Provide 3/4" gap around perimeter between roofing and platform cover to facilitate re-roofing. Extend drip lip down 3" (min.). Provide 30# felt under platform cover.

3.7 TESTS AND ADJUSTMENTS

A. General: Unless otherwise directed, tests shall be witnessed by a representative of the Architect. Work to be concealed shall not be enclosed until prescribed tests are made. Should any work be enclosed before such tests, the Contractor shall, at his expense, uncover, test and repair all work to original conditions. Leaks and defects shown by tests shall be repaired and entire work retested.

B. Piping Tests:

1. General: Tests may be made in sections, however, all connections between sections previously tested and new section must be included in the new test. There shall be no drop in pressure during test except that due to ambient temperature changes. All components of system not rated for test pressure shall be isolated from system before test is made.

C. Ductwork and Plenum Tests: Ductwork and plenums shall be tested in accordance with SMACNA Standards using blower, orifice and manometers. Leakage shall not exceed 3% of design CFM capacity at 150% of design system pressure.

3.8 SYSTEM ENERGY BALANCE

A. Scope: Provide the services of an independent test and balance agency to test, adjust and balance, retest and record performance of the system to obtain design quantities as specified. The agency must prove that they have no affiliation with any equipment manufacturer, design engineer, installing contractor, or any other party which might lead to a conflict of interest, in order to provide an unbiased, third party system balance and report.

B. Qualifications: Prior to commencing work, the agency shall be reviewed by the Engineer and shall be certified by the Associated Air Balance Council or National Environmental Balancing Bureau. The agency shall provide documentation of having successfully completed at least five projects of similar size and scope.

C. Instruments: All instruments shall be accurately calibrated; calibration histories shall be available for examination. Application of instrumentation shall be in accordance with AABC or NEBB standards.

D. Submittals: Include in shop drawings copies of forms to be used for testing and balancing showing all data which is to be recorded. Three copies of completed balance report shall be submitted for review.

E. Procedure - General: Procedure shall be in accordance with Associated Air Balance Council's "National Standards for Field Measurements and Instrumentation - Total System Balance", Volume Two, No. 12173, or equivalent NEBB standards. System shall be in full, continuous operation during test. Balanced quantities shall be plus 10%, minus 0% of design quantities. All nameplate data, manufacturer, model and serial numbers shall be recorded for each item tested.

F. Extended Warranty: The test and balance agency shall include an extended warranty of 90 days after completion of test and balance work, during which time the Engineer, at his discretion, may request a recheck or resetting of any item or items in test report. The agency shall provide technicians to assist the Engineer in making any tests he may require during this period of time.

G. Air Balance Procedure (For Each Air Handling System):

1. All air filters shall be clean when air balance is performed.

2. Adjust blower RPM to design requirements.

3. Record motor full load amperes.

4. Make pitot tube traverse of main supply and return ducts and obtain design CFM at fans.

5. Record system static pressures, inlet and discharge.

6. Record filter quantity, size(s) and pressure drop across filter(s) at each filter bank.

7. Adjust system for design CFM recirculated air.

8. Adjust system for design CFM outside air.

9. Adjust all diffusers, grilles and registers to plus 10%, minus 0% of design requirements.

10. Adjust CFM at all exhaust fans, make-up units, etc. (high and low speed, where applicable). Record applicable data from items 1 through 11 above.

11. Each grille, diffuser and register shall be identified as to location.

12. Verify proper diffusion pattern for all ceiling grilles and that all sidewall grilles are set for 5 degrees upward deflection unless otherwise noted. Make a notation of any that are not set properly.

13. All diffusers, grilles and registers shall be adjusted for required air patterns and to minimize drafts.

14. As a part of the work of this contract, THE AIR CONDITIONING CONTRACTOR shall make any changes in pulleys, belts and dampers or the addition of dampers required for correct balance as recommended by air balance agency, at no additional cost to Owner.

3.9 TEMPERATURE CONTROL SYSTEM

A. Scope: The control system includes control panels, control devices, line and low voltage control and interlock wiring, conduit and related equipment as required for proper operation of all controlled systems. Control and interlock wiring includes wiring to controllers, switches, timers, relays, etc. Power wiring and disconnect switches are included in the Electrical Specifications except that power wiring required for control devices such as thermostats, valves, etc., is included in the control system.

B. Type of system: The control system shall be electric//direct digital.

C. Contractor Qualifications: All controls shall be furnished and installed by a Contractor who is licensed, certified or contracted by the controls manufacturer for design, installation, start-up and service of their product. The Contractor must have factory supplied training and support. The Contractor must have sufficient personnel to respond to a trouble call at the site within two hours. The Contractor's local manager shall have a minimum of five years experience in the design, installation, start-up and service of similar systems. The Contractor shall submit a list of at least five projects which are similar in size, scope and contract value to this project. This list shall include the Owner's contact person, phone number and controls contract value.

D. Submittals: Submittals shall include the following:

1. Contractor qualifications. Manufacturer licenses, contracts or certifications for the installer shall be submitted on manufacturer's letterhead.

2. Manufacturer's data for all devices.

3. Manufacturer's data for all software.

4. Diagrams showing control schematics. Diagrams shall include all sensors, terminal strips, panels and control devices. Locations of all devices shall be indicated.

5. Sequence of operation.

E. Basis of Design and Substitutions: This specification is based on a Siebe system. Other manufacturers may be submitted for review. A conformance document must be submitted with a substitution. This document shall list the title of each

paragraph of the specification with a notation of compliance, partial compliance with full explanation, or non compliance. If compliance is by a means or method other than what is specified, the functional equivalent proposed shall be described in detail.

F. System Components:

1. Thermostats: Concealed, adjustable, dual set points and function selectors. Locking cover without temperature indicator.

2. Wall Switches: Plates for all wall switches and timers shall match those specified in Division 26.

3. Labels: All labels, signs, etc. shall be engraved, laminated plastic, white on black background, 1/8" high lettering, minimum.

4. Temperature Controllers: All temperature controllers shall have adjustable set points and be identified with "Lamicoid" labels.

5. Time Clock: Two channel digital with separate start/stop capability for each channel. 100 hr. battery backup. Each H/C unit shall have control wires run to control panel. Coordinate the zoning of clocks and H/C units with Engineer. Grasslin.

6. Bypass Timer: 0-2 hour (adjustable) mechanical or digital timer, located adjacent to room thermostat.

7. Temperature Control Panels: Hinged, lockable front panel. Each panel and each control device or readout on the front of the panel shall be identified with an engraved plastic label with 1/4" high lettering, white on black background. Pilot lights shall be the push-to-test type.

8. Smoke Detectors: Smoke detector shall be 4-wire photoelectric type, 115 VAC. The detector shall operate at air velocities from 100 FPM to 4000 FPM. The detector head shall not require additional filters or screens. The detector shall be mounted in a sheet metal housing with removable cover. A visual indication of alarm and pilot must be provided on detector front mounted at 30 degrees angle for a wide viewing angle. Manual test and reset button on the front of the detector. Terminal connections shall be of the screw type. Power supervisory relay. Minimum of two sets of DPDT Form-C relay alarm contacts (one reserved for fire alarm system). UL listed. California State Fire Marshal listing #7272-1653:0203. System Sensor D4120.

9. Electric Actuators:

a. General: Fully modulating, UL listed. Visual position indicator, manual override and clear weather shield where exposed to weather. Belimo.

b. Damper Actuators: Positive position feed back and spring return. Actuators shall be direct mounted onto the damper control shaft without linkage. Damper actuators shall be sized to provide a minimum of 5 in-lbs torque per square foot of damper face area.

10. Duct Sensing Elements: Fully proportioning. Duct sensors shall be of the averaging type extended across at least 75% of the duct. At insulated ducts, sensors shall have proper extensions.

G. System Shall Function as Follows:

1. General: All time clocks, transformers, terminal blocks, relays, etc., shall be mounted in a single control panel. Provide 0-2 hour mechanical timer adjacent to each room thermostat to energize the control circuit for heating/cooling units. Label "BYPASS TIMER OPERATES UNIT AT OTHER THAN SCHEDULED HOURS".

2. Heating/Cooling Units: Provide room thermostat with subbase having fan auto-on and heat-auto-cool switches. Room thermostat shall control the unit to maintain 75ºF (cooling) or 72ºF (heating).

3. Exhaust Fans: See Schedule for control.

H. Installation: All electrical work shall be in accordance with the CaliforniaElectrical Code and the Electrical Specification Sections. All electric/electronic systems shall be hardwired in conduit. Wiring shall be concealed in walls, above the ceilings, or below grade unless otherwise noted. Exposed wiring shall run parallel to room surfaces; location shall be approved by the Architect. No structural member shall be weakened by cutting, notching, boring or otherwise. Provide a 120 volt circuit for each device requiring external power. Dedicated circuits shall be provided where required. Any penetrations in walls or ceilings for sensors and tubing such as pressure sensor tubing, etc. shall be provided with escutcheons to match the adjacent finish to ensure a neat appearance. Any devices or wiring exposed to the weather shall be protected in weatherproof enclosures such as NEMA 3R and weatherproof conduit. Set, test and adjust the system for proper operation.

I. Programming: The Contractor shall be responsible for programming the system and shall coordinate the scheduling (on/off times) with the Owner.

J. Training: Prior to final acceptance, the Contractor shall provide operational training to the Owner's personnel. The training sessions shall include a complete demonstration of the system. Dates and times of the training sessions shall be coordinated through the Owner not less than one week prior to session. A total of 16 hours of instruction shall be provided - 8 hours initially, and 8 hours to be spread throughout the first year of operation. The Contractor shall maintain a log of training sessions including dates, times and names/titles of those attending. The Contractor shall submit a copy of this log on request.

K. Testing and Acceptance: The Contractor shall furnish a complete and operating system. The Contractor shall also verify, in the presence of the Owner, the system accuracy and proper function of each controlled device and sensor. The following items shall be successfully demonstrated prior to acceptance by the Owner:

1. All system outputs including controllers, relays, and other control devices shall be addressed and start/stop functions demonstrated.

2. All inputs shall be displayed and all event-initiated functions shall be demonstrated.

3. Demonstrate program integrity and power restore sequence during and after a power failure and restoration.

4. Deliver all As-Built drawings, wiring diagrams, equipment specifications, Operation and Maintenance Manuals and other documentation as required to describe the system.

5. Complete operator training in the use, programming, and operation of the system.

L. Operation and Maintenance Manuals: Furnish Operating and Maintenance Manuals for all components. These manuals shall contain full documentation which shall include, without being limited to, the following:

1. General description and specifications.
2. Installation and initial checkout procedures.
3. Principles and theory of operation.
4. Complete trouble-shooting procedures and diagrams.
5. Complete alignment and calibration procedures for all components.
6. Preventative maintenance requirements.
7. Detailed schematics and assembly drawings.
8. Complete recommended spare parts lists including unit prices.

3.13 ACCEPTANCE TESTING

A. Scope: Acceptance Testing Agent shall be responsible for undertaking all required acceptance requirement procedures as outlined in the 2005 Nonresidential Compliance Manual and the 2005 Nonresidential ACM Manual, Appendix NJ.

B. The Contractor shall be the Acceptance Testing Agent.

C. Acceptance Testing Agent shall review the bid documents for the following:

1. Conformance to the acceptance requirements as noted on the MECH-1-C form.
2. Sensor locations.
3. Devices.

4. Control sequences of operation.

D. Acceptance Testing Agent shall perform the following:

1. Review system installations by performing a construction inspection prior to testing.
2. Perform required acceptance tests as listed below under test procedures for mechanical systems.
3. Identify all performance deficiencies, ensuring they are corrected and again implementing the acceptance requirement procedures until all specified systems and equipment are performing in accordance with the Standards.
4. Document the results of the acceptance requirement procedures on the acceptance test forms and indicate satisfactory completion by signing the Certificate of Acceptance and recording their State of California Contractor's License Number or State of California Professional Registration License Number.

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E. Test procedures for Mechanical Systems:

1. Test and verification procedures for mechanical systems that require acceptance testing are listed below:

a. Constant Volume Outdoor Air Acceptance (Form MECH-2-A for Appendix NJ 3.2)
b. Constant Volume Packaged HVAC Systems Acceptance (Form MECH-3-A for Appendix NJ 4.1)
c. Air-Side Economizer Acceptance (Form MECH-4-A for Appendix NJ 7.1)
d. Packaged Systems Demand Control Ventilation Acceptance (Form MECH-6-A for Appendix NJ 8.1)
e. The numbers preceding each test are keyed to the section of the Nonresidential ACM Manual, Appendix NJ where the required test is documented.

F. Acceptance Agent upon completion of undertaking all required acceptance procedures shall complete, sign and record their State of California Contractor's License Number or State of California Professional Registration License Number on the Certificate of Acceptance MECH-1-A and present to the Owner.

END OF SECTION

SECTION 260000
SUMMARY OF ELECTRICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections shall form a part of this Section, with the same force and effect as though repeated here.

1.2 SUMMARY

A. In general, the Electrical Work described herein consists of the modification of existing electrical, lighting and signal systems in place and the installation of new electrical, lighting and signal systems equipment. All work shall be completed as directed by the Owner's authorized representative, in accordance with the Contract, Specifications and Construction Documents listed below.

1. General Conditions of Contract

2. Specifications:

Section	Title
260000	Summary of Electrical Work
260100	General Conditions for Electrical Work
260500	Basic Electrical Materials and Methods
260526	Grounding
265113	Lighting
266100	Lighting Control Systems
269500	Electrical Acceptance Tests
272000	Communications Systems
274100	Audio-Video Systems
283100	Fire Alarm System

3. Electrical Construction Drawings as listed on the Drawing Index of the Construction Drawing set.

B. This Section includes all necessary and required work to complete the construction as indicated in the Drawings, called for by notes or schedules, or specified herein. This work includes the furnishing of all permits, labor, supervision, services, materials, tools, equipment, testing, transportation and miscellaneous expenses, and the performance of all operations necessary to or incidental to completion of lawful and operating electrical power, lighting and signal systems, whether or not specifically mentioned.

C. All work not shown in complete detail shall be installed per the CEC and in conformance with the best standard practice for the trade. Any deviation from the approved Drawings shall be submitted in writing to the Engineer and Owner for approval prior to the installation of the work in question.

D. This work shall include, but not necessarily be limited to, the following elements:

1. Demolition and Phasing:

   a. De-energize, disconnect and remove electrical feeds to devices and equipment being removed or relocated.

   b. Disconnect and remove existing electrical facilities in areas of remodel and demolition that are not to be reused.

   c. Make temporary feeds and connections to areas and equipment to allow phased construction and continuing operation.

2. Electrical Distribution:

   a. Power distribution system, as shown, complete with panelboards, conduits, feeders, pull boxes, fittings and related equipment and equipment pads.

   b. Trenching, conduits and feeders for electrical power.

3. Grounding

   a. Grounding system including installations of ground rods, ufer grounds, and ground rings, as shown. Connections to water and/or gas piping and building steel.

   b. Testing of grounding system as outlined in Specification Section 269500.

4. Signal Distribution:

   a. Trenching, conduits and conductors for signal systems.

   b. Building mounted conduits and conductors for signal systems

5. Building Electrical and Mechanical Systems:

   a. Complete system of branch circuit wiring, conduit and distribution equipment for lighting, receptacles and power.

   b. Electrical work associated with mechanical equipment, including conduit, conductor, disconnect switches and motor starters.

   c. Furnish roof jacks for the weatherproofing of each electrical conduit penetrating the roof. Roof jacks shall be of the material specified for the specific roofing system and shall be delivered to the general contractor/construction manager for installation by the roofing contractor.

   d. Connection to all equipment as furnished by other Sections of these Specifications or as listed on Drawings as furnished by Owner.

   e. Remove, extend and re-install electrical devices in/on walls receiving new wall coverings.

   f. Provide surface wireways for replacement of circuits and feeders where wall surfaces are to remain.

6. Lighting:

   a. Replace existing Lighting System with new Lighting System as shown in Drawings, including fixtures, hangers, lamps, wall switches and lighting controls.

   b. Provide complete lighting system including fixtures, hangers, lamps, wall switches and lighting controls.

c. Provide complete Lighting Control System consisting of motion sensors, timer switches and other controls as shown in Drawings.

7. Data Distribution System:

   a. Extension of existing Data system.

8. Audio-Video System:

   a. Remove existing audio-video system equipment and cabling.

   b. Provide audio-video cabling.

   c. Install owner furnished audio-video equipment.

9. Fire Alarm System:

   a. Pre-testing of existing Fire Alarm system prior to initiation of Fire Alarm work or other work that may affect Fire Alarm system.

   b. Extension of existing Fire Alarm / Emergency Voice Alarm Communicaiton system per Specification Section 283100 including Fire Alarm Control Panels, Signal Expander Panels, initiation devices, signal devices, control devices, annunciators, access panels, terminal cabinets, conduit, wiring and terminations and equipment for a complete working system.

10. Intercommunications, Clock and Program System:

    a. Extension of existing Intercommunications and clock systems.

11. Each system shall be terminated, tested and calibrated by a factory-authorized installer. This same installer shall terminate and test any peripheral equipment required for the operation of the system.

12. Equipment Connections

    a. Provide equipment connections and coordination in accordance with manufacturer's recommendations and product submittals.

    b. Provide equipment connections and disconnect switches as required for the following equipment:

       1) Mechanical equipment.

E. Products supplied by Owner (or others, as noted) and installed by Contractor under this Section.

1. Projectors

2. Amplifiers

3. Speakers

4. HDMI Extenders

5. Bluetooth Receivers

6. Pre-terminated AV cables

F. Work specifically **excluded** from this Division.

1. Furnishing of motors.

G. It shall be understood that the existing conduit with its wiring is presently active (hot), in operation with its pertinent equipment.

H. It shall be noted that this construction work will be planned and executed during ongoing operation of the facility. Any modifications to the existing equipment currently in operation shall be done during scheduled shutdowns and coordinated with the Owner's authorized representative and facility operating personnel to assure minimum downtime.

I. In order to avoid disruption to facility operations, certain items of work must be completed before other items of work can be started. Contractor shall coordinate with the Owner's authorized representative as to the sequence of construction activities.

J. Drawings showing equipment layout, conduit runs, conduit sizes, number of wires, wire types, wire groupings and size will not be furnished. It shall be the Contractor's responsibility to prepare such drawings in accordance with specifications, project requirements and code to facilitate the installation.

K. Furnish, install and connect an underground grounding system, specifically mentioned on drawings as part of this contract, including all necessary materials and connections as required by code and/or as shown on the construction drawing.

L. Furnish, install and connect all above grade grounding materials and make aboveground connections of underground cables to equipment and/or structural steel as shown on the construction drawings and as required by code.

M. Size, furnish, install and connect new conduit, conduit fittings, and seal fittings, expansion fittings and supports. This includes above grade as well as underground.

N. Size, furnish, and install junction, pull and terminal boxes, in accordance to code requirements and as shown on the construction drawings.

O. Size, furnish and install all supports required for conduit installation, supports required for the installation of the equipment furnished by this Contractor and equipment furnished by others but installed by this Contractor.

P. Size and field cut the openings for conduits passing through building walls and/or floors. Close and seal all openings after conduits have been installed and/or removed. Closing shall be compatible with, or of the same material as wall and/or floor.

Q. Furnish and install markers indicating voltage levels (e.g., 277/480V, 120/208V, etc.) for all of the electrical equipment.

R. Furnish and install wire tags in accordance with the specifications indicating wire number as shown on electrical schematics, one line, three line diagrams and specifications.

S. Furnish, install and connect all power, control and instrumentation cable, including all necessary cable lugs, connectors and terminations.

T. Perform all testing per the Specifications and report to Owner's field representative in a timely manner so as not to impede the scheduled completion of the Contract.

U. Furnish all material, labor and testing equipment necessary to check out and test the complete power distribution, control and pneumatic systems for all process and utility equipment in strict accordance with specifications. This shall include check out/start up of systems and/or equipment as directed by Owner.

V. Prime paint all uncoated carbon steel items furnished by Contractor.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION 260000

SECTION 260100
GENERAL CONDITIONS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections shall form a part of this Section, with the same force and effect as though repeated here.

1.2 SUMMARY

A. The provisions of this Section shall apply to all of the following Sections of Divisions 26-28 of these Specifications and shall be considered a part of these Sections.

1.3 QUALITY ASSURANCE

A. All work and materials shall fully comply with rules and regulations of all applicable codes cited below. Nothing in these Drawings or Specifications shall be interpreted as to permit any work not in compliance with these codes. Where work is detailed and/or specified to a more restrictive standard or higher requirement, that standard or requirement shall govern such work. Applicable codes include, but are not limited to, the following:

1. California Code of Regulations (CCR)
    a. Title 8, Industrial Relations
    b. Title 17, Public Health
    c. Title 24, Building Standards
2. 2022 California Building Code.
3. 2022 California Fire Code.
4. 2022 California Electrical Code.

B. All electrical components, devices and accessories shall be listed with Underwriters Laboratories, Inc. (or other testing agency acceptable to authorities having jurisdiction), shall meet their requirements, shall bear their label wherever standards have been established and label service is regularly furnished by that agency, and shall be marked for intended use.

1.4 PERMITS, FEES AND TAXES

A. The Contractor shall secure all necessary permits and pay all required fees and taxes. He shall notify the proper authorities and have the work inspected and tested as required by jurisdictional requirements, pay all charges in connection therewith, and shall present to the Owner properly signed certificates of inspection. Acceptance of the work will not be considered until such certificates have been delivered.

1.5 TEMPORARY UTILITIES

A. The Contractor shall fulfill utility requirements for and pay all one-time and monthly charges for temporary construction utility usage.

1.6 EXISTING CONDITIONS

A. The Contractor shall carefully examine the site and existing buildings, compare them with Drawings and Specifications, and shall have satisfied himself as to the conditions to be encountered during the performance of the work. No subsequent allowance shall be made on his behalf for any additional expense he may incur due to failure or neglect of Contractor to examine site and to include existing conditions in bid.

B. Any work done as an addition, expansion, or remodel of an existing system shall be compatible with that system.

C. The Contractor shall examine all record drawings made available by the Owner to locate existing underground systems, utilities, conduits, and pipes prior to installing the electrical distribution system. The Contractor shall also examine the site for possible locations of sprinkler pipes. Any damage done to the existing systems during the course of the electrical work, whose locations could be reasonably determined, shall be repaired to the satisfaction of the Owner and the utility or agency involved, at the expense of the Contractor.

1.7 CONDUCT OF THE WORK

A. The Contractor shall maintain on the job a competent foreman or a superintendent at all times to superintend the Work.

1.8 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. The Engineer's decision will be final on interpretation of the Drawings and Specifications. Whenever the words "AS MAY BE DIRECTED", "SUITABLE", or "APPROVED EQUAL", or other words of similar intent and meaning are used, implying that judgment is to be exercised, it is understood that it is in reference to the judgement of the Engineer.

1.9 SUBMITTALS

A. See Specification Section 013300, SUBMITTAL PROCEDURES, for additional information and requirements.

B. Shop Drawings and Product Data

1. **Shop Drawings and Product Data** shall comply with the following requirements:

a. The Contractor shall submit for review, complete sets of Shop Drawings and Product Data brochures for materials and equipment as required by each section of the Specifications.

b. All Shop Drawings and Product Data shall be submitted at one time in a neat and orderly fashion in a suitable binder with a Title Sheet including Project, Engineer and Contractor, Table of Contents, and indexed tabs

dividing each group of materials or item of equipment. The Specification paragraph number for which they are proposed shall identify all items. The mark number as indicated on Drawings shall also identify all equipment and fixtures.

c. Shop Drawings and Product Data submittal shall include manufacturer's name and catalog numbers, dimensions, loads, and all other characteristics and accessories as listed in the Specifications or on the Drawings. All loads, characteristics, and accessories called for in the Specifications or on the Drawings shall be highlighted, circled or underlined on the Shop Drawings and Product Data. Descriptive literature shall be current factory brochures and submittal sheets.

d. Fax submittals are not acceptable.

e. Material or equipment shall not be ordered or installed until the Engineer processes the written review. Any item omitted from the submittal shall be provided as specified without substitution.

f. Prior to submission of the Shop Drawings and Project Data, Contractor shall review and certify that they meet the requirements of the Contract Documents.

g. A minimum period of two weeks, exclusive of transmittal time, will be required each time Shop Drawings and/or Product Data are submitted or resubmitted for review. The Contractor shall consider this time when scheduling a submittal date.

C. Submittal Review

1. Submittals will be reviewed for general conformance with the design concept, but this review does not guarantee quantity shown, nor does it supersede the responsibility of the Contractor to provide all materials, equipment and installation in accordance with the Drawings and Specifications.

2. The Contractor shall agree that Shop Drawings and Product Data submittals processed by the Engineer are not Change Orders and that the purpose of Shop Drawings and Product Data submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept. The Contractor demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use.

3. It shall be clearly understood that the noting of some errors, but the overlooking of others, **does not** grant the Contractor permission to proceed in error or in conflict with Contract Documents. The Contractor shall agree that if deviations, discrepancies or conflicts between Shop Drawings and Design Drawings and Specifications are discovered either prior to or after Shop Drawing submittals are processed by the Engineer, the Design Drawings and Specifications shall control and shall be followed.

4. If a resubmittal is required, submit a complete copy of the Engineer's review letter requiring such with the resubmittal.

D. Substitutions

1. See Specification Section 012500, SUBSTITUTION PROCEDURES, for additional information and requirements.

2. **Substitutions** shall comply with the following requirements:

   a. Manufacturers, model numbers and other pertinent information listed in the Specifications or on the Drawings are intended to establish minimum standards of performance, function and quality. Unless otherwise noted, the Contractor may submit equivalent compatible UL-listed equipment from other manufacturers for review, as long as the minimum standards are met.

   b. Calculations and other detailed data indicating how the item was selected shall be included for items that are not specified. Data must be complete enough to permit detailed comparison of every significant feature, function, performance, and quality characteristic that is specified, scheduled or detailed. The comparison must prove that the substituted item equals or exceeds the requirements of the specified item.

   c. The Contractor shall assume full responsibility that substituted items or procedures will meet the Specification and job requirements and shall be responsible for the cost of redesign and modifications to the work caused by these items.

   d. At the Engineer's request, the Contractor shall furnish locations where equipment similar to the substituted equipment is installed and operating along with the user's phone numbers and contact person. Satisfactory operation and service history will be considered in the acceptance or rejection of the proposed substitution.

E. Record Drawings

1. See Specification Section 017839, PROJECT RECORD DOCUMENTS, for additional information and requirements.

2. **Record Drawings** shall comply with the following requirements:

   a. At the beginning of the Project, one print of each applicable Drawing will be issued to the Contractor specifically for use in preparing Record Drawings. As the work progresses, the Contractor shall maintain a record of all deviations in the work from that indicated on the Drawings. Final locations of all underground work shall be recorded by depth from finished grade and by offset distance from permanent surface structures, e.g. building, curbs, walks. The original Drawings will be made available to the Contractor, from which he shall have made, a set of reproducible Drawings. The Contractor shall then transfer the changes, notations, etc. from the marked-up prints to the reproducible Drawings. The Record Drawings (marked-up prints and reproducibles) shall be submitted to the Engineer for review, after first securing the Inspector's verification by signature.

F. Operations and Maintenance Instructions

1. See Specification Section 017823, OPERATION AND MAINTENANCE DATA, for additional information and requirements.

2. **Operations and Maintenance Instructions** shall comply with the following requirements:

   a. Three copies of Operation and Maintenance Instructions and Wiring Diagrams for all equipment shall be submitted to the Engineer. All instructions shall be clearly identified by marking them with the same designation as the equipment item to which they apply (e.g. UPS-1). All

Wiring Diagrams shall agree with reviewed Shop Drawings and indicate the exact field installation.

b. All instructions shall be submitted at the same time and shall be bound in a suitable binder with tabs dividing each type of equipment (e.g. MCC, UPS, etc.). Each binder shall be labeled indicating "Operating and Maintenance Instructions, Project Title, Contractor, Date" and shall have a Table of Contents listing all items included.

c. The Contractor shall verbally instruct the Owner's maintenance staff in the operation and maintenance of all equipment and systems. The Engineer's office shall be notified 48 hours prior to this meeting.

d. The Contractor shall prepare a letter indicating that all Operation and Maintenance Instructions (printed and verbal) have been given to the Owner, to the Owner's satisfaction. This letter shall be acknowledged (signed) by the Owner and submitted to the Engineer.

1.10 COORDINATION

A. See Specification Section 013113, PROJECT MANAGEMENT AND COORDINATION, for additional information and requirements.

B. Electrical Drawings are essentially diagrammatic, unless specifically dimensioned. Some work may be shown offset for clarity. The actual locations of all materials, conduits, fixtures, supports, etc. shall be carefully planned prior to installation of any work in order to avoid all interferences with each other, or with architectural, civil, mechanical, plumbing, structural or other elements.

C. While the size and location of equipment are shown to scale wherever possible, all dimensions and conduit/conductor data shall be verified in the field.

D. Where the work requires connections to be made to equipment furnished and set in place by others, the Contractor shall obtain exact rough-in dimensions from the manufacturer of such equipment and he shall install the connections in a neat and workmanlike manner.

E. If discrepancies are discovered between Drawings and Specifications requirements, the more stringent requirement shall apply.

F. All conflicts shall be called to the attention of the Architect and the Engineer prior to the installation of any work or the ordering of any equipment.

G. No work shall be prefabricated or installed prior to this coordination. No additional compensation will be considered to the Contractor for any prefabrication or installation performed prior to this coordination.

1.11 SCHEDULING

A. All work shall be scheduled subject to the review of the Architect, Engineer and the Owner. No work shall interfere with the operation of the existing facilities on or adjacent to the site. The Contractor shall have at all times, as conditions permit, a sufficient force of workmen and quantity of materials to install the work for which contracted, as rapidly as possible consistent with good work, and shall cause no delay to other Contractors engaged upon this project or to the Owner.

1.12 WARRANTY

A. See Specification Section 017836, WARRANTIES, for additional information and requirements.

B. Guarantee shall be in accordance with the General Conditions. These Specifications may extend the period of the guarantee for certain items. Where such extension are called for, or where items are normally provided with guarantee periods in excess of that called for in the General Conditions, the Certificate of Guarantee shall be furnished to the Owner through the Engineer.

C. Contractor shall deliver to the Owner a written guarantee on all workmanship, materials and equipment for a period of one (1) year from the date of acceptance by the Owner. Any work found to be faulty during that period of time shall be corrected at once, upon written notification, at the expense of the Contractor. This shall include repair or replacement of the premises that may be damaged as a result of faulty work and materials furnished.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment shall be new unless otherwise noted.

B. Materials and equipment of a given type shall be by the same manufacturer.

C. Materials and equipment shall be covered or otherwise protected during construction as required to maintain the material and equipment in new factory condition until project acceptance. Upon completion of work and prior to final inspection, Contractor shall thoroughly clean all exposed fixtures, trim and equipment, and shall leave the entire installation in neat, clean, and useable condition. Materials and equipment shall be free of dents, scratches, marks, shipping tags, and all defacing features at time of project acceptance.

D. The Contractor shall order materials and equipment in a timely manner to prevent any delay in the construction schedule, and he shall bear any penalty by vendors to meet schedules.

E. Verify all dimensional information to ensure proper clearance for installation of equipment. Check all materials and equipment after arrival on the jobsite and verify compliance with the Contract Documents.

PART 3 - EXECUTION

3.1 DEMOLITION

A. The Contractor shall protect existing electrical equipment and installations that are not indicated to be removed. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.

B. Exposed electrical equipment and installations, indicated to be demolished, shall be removed in their entirety.

C. Buried raceway and wiring, indicated to be abandoned in place, shall be cut 2 inches below the surface of adjacent construction and removed in its entirety. Raceways abandoned in place shall be capped and disturbed surfaces shall be patched to match existing finish.

D. Demolished material shall be removed from Project site.

E. Components indicated for relocation shall be removed, stored, cleaned, reinstalled, reconnected, and made operational.

3.2 CUTTING AND PATCHING

A. The Contractor shall perform all cutting and drilling, or other work, required to provide openings in walls, ceilings, floors, footings, foundations or other structures necessary to accomplish work under this Specification Division. The cutting shall be performed by skilled mechanics of the trades involved.

B. Cutting or coring shall not impair the strength of the structure. Any damage resulting from this work shall be repaired at the Contractor's expense to the satisfaction of the Architect.

C. Wherever possible, work shall be done in a concealed and neat workmanlike manner requiring the least amount of cutting of studs, plates and woodwork. Such cutting or notching is allowed only after consultation with and by permission of the Engineer.

D. The Contractor shall repair and refinish disturbed finish materials and other surfaces to accurately match adjacent undisturbed new or existing structures and surfaces and shall install new fireproofing where existing fire-stopping has been disturbed. The repair and refinishing of materials and other surfaces shall be by skilled mechanics of the trades involved.

E. All cuts are to be clean with no chipping. Where chipping occurs as a result of work in a cut area, a new clean cut shall be made immediately prior to patching.

3.3 EXCAVATION AND BACKFILL

A. The Contractor shall provide excavation and backfilling required to complete work detailed in the Drawings and Specifications. Unless otherwise noted, minimum earth cover above top of conduit outside building walls shall be 24", not including base and paving in paved areas.

B. The location of all underground facilities shall be verified with the Owner and utility companies prior to the commencement of any excavation.

C. The Contractor shall contact Underground Service Alert (USA), at 1-800-642-2444, ten (10) days prior to doing any excavation or trenching, and shall advise USA of the work schedule and comply with their requirements.

D. The Contractor shall notify the Owner 72 hours prior to any excavation.

E. Provide all shoring required by site conditions. Where over-excavation occurs, provide compacted sand backfill. Where groundwater is encountered, remove to keep excavation dry, using well points and pumps as required.

F. The conduit shall be laid on firm soil cut true and even to afford bearing for the full length of the barrel of the conduit.

G. When the bottom uncovered at sub-grade is soft and, in the opinion of the Engineer, cannot support the conduit, a further depth shall be excavated and refilled to conduit foundation grade as required by the Engineer.

H. Backfill (where concrete encasement is not required):

1. Material 3" below, 3" around, and to 6" above conduit shall be sand. Place carefully around and on top of conduit, taking care not to disturb conduit. Consolidate with vibrator.

2. Material from 6" Above Conduit to Grade shall be sandy or silty loam, free of lumps, laid in 6" layers, uniformly mixed to proper moisture and compacted to required density. If backfill is determined to be suitable and required compaction is demonstrated by laboratory test, water compaction in 6" layers may be used, subject to review by Engineer.

I. No excavation below the level of, or adjacent to, foundations of footings shall be made except in a manner approved by the Structural Engineer.

J. Compaction

1. Prior to compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

2. Under **Structures, Building Slabs, Walkways, and Steps**, compact top 6" of sub-grade and each layer of backfill or fill material at 92% maximum relative compaction. Compact upper 2' of backfill in utility trenches or other excavations to 92% minimum relative compaction.

3. In **Lawns and Unpaved Areas**, compact top 6" of sub-grade material to 85% relative compaction.

4. Under **Pavement**, compact top 8" of sub-grade immediately beneath the base course at 95% minimum relative compaction.

3.4 CONCRETE EQUIPMENT BASES - (SITE CONTRACTOR)

A. The Contractor shall provide a concrete equipment base for each piece of electrical equipment required to have a base as shown in the Drawings, Notes and Details.

B. Concrete equipment bases shall be 6" high concrete, 3500 PSI strength, unless otherwise noted. Base shall extend 6" beyond the largest dimensions of the equipment, unless otherwise noted. The top edge of the base shall have a ¾" chamfer. The base shall have #4 reinforcing bars at 12" on center, each way, located at the mid-depth of the base.

C. If the base is not poured at the same time as the floor slab with base rebar tied to floor rebar, the base shall be anchored to the floor slab per the following criteria:

1. Drill 1" diameter, 4" deep hole in floor.

2. Fill hole with **Simpson SET Epoxy** then insert 8" long, #4 rebar into hole. Tie this rebar to that required for the equipment base.

3. Provide a minimum of 4 of these anchors per base but no more than 4 feet apart in either direction.

4. Anchor points shall be 12" from the edge of the base.

D. Concrete anchors shall be steel bolts with expansion anchors requiring a drilled hole. Powder-driven anchors are not acceptable. Minimum concrete embedment shall be 4.5 diameters but not less than manufacturer's requirements for minimum strength. Minimum spacing shall be 10 diameters center-to-center and 5 diameters center to edge of concrete but not less than manufacturer's requirements for minimum strength. Maximum allowable stresses for tension and shear shall be 80% of the ICC-ES test report values.

E. Where applicable, concrete structures shall be submitted to the serving utility for their approval prior to installation.

F. Concrete bases for pole mounted lighting fixtures shall be 3500PSI strength, unless otherwise noted, and shall have vertical reinforcing bars with horizontal reinforcing bar ties as detailed on the drawings. The top edge of the concrete base shall have a 1" chamfer.

3.5 SEISMIC ANCHORAGE AND BRACING

A. Equipment Anchorage

1. All electrical equipment and components shall be anchored and installed per the details on the DSA approved construction documents. Where no detail is indicated, the following components shall be anchored or braced to meet the force and displacements requirements prescribed in the 2022 CBC, Sections 1617A.1.18 through 1617A.1.26. and ASCE 7-16 Chapter 13, 26, and 30:

   a. All permanent equipment and components

   b. Temporary or movable equipment that is permanently attached (e.g. hard wired) to building utility electrical service.

   c. Movable equipment which is stationed in one place for more than 8 hours and heavier than 400 pounds are required to be anchored with temporary attachments.

2. The attachment of the following electrical components shall be positively attached to the structure, but need not be detailed on the plans. These components shall have flexible connections provided between the components and associated conduit.

   a. Components weighting less than 400 pounds and have a center of mass located 4 feet or less above the adjacent floor or roof level that directly support the components.

b. Components weighting less than 20 pounds, or in the case of distributed systems, less than 5 pounds per foot, which are suspended from a roof or floor or hung from a wall.

For those elements that do not require details on the approved drawings, the installation shall be subject to the approval of the Structural Engineer of Record and the DSA District Engineer. The project inspector will verify that all components and equipment have been anchored in accordance with above requirements.

B. Electrical Distribution System Bracing

1. Electrical distribution systems shall be braced to comply with the forces and displacements prescribed in ASCE 7-16 Section 13.3 as defined in ASCE 7-16 Section 13.6.7, 13.6.6, 13.6.5, and 2022 CBC, Sections 1617A.1.23, 1617A.1.24, 1617A.1.25, and 1617A.1.26.

2. The bracing and attachments to the structure shall be detailed on the approved drawings.

3. Copies of the manual shall be available on the jobsite prior to the start of hanging and bracing of the electrical distribution systems.

4. The Structural Engineer of Record shall verify the adequacy of the structure to support the hanger and brace loads.

3.6 CLEANING AND PROTECTION

A. The Contractor shall, progressively and at completion of the job, thoroughly clean all of his work including outlets, fittings, and devices, and inspect exposed finishes. The Contractor shall remove all burrs, dirt, grease, paint spots, stains, labels, tags, rust, foreign material, and construction debris resulting from his work.

B. The Contractor shall protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 260100

SECTION 260500

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections shall form a part of this Section, with the same force and effect as though repeated here.

1.2 SUMMARY

A. See Section 260000

1.3 STANDARDS

A.	NEMA 250	Standard for Enclosures for Electrical Equipment (1000 Volts Maximum)

PART 2 - PRODUCTS

2.1 CONCRETE PADS, PULL BOXES AND MANHOLES

A. At the Contractor's option, he shall provide cast-in-place or pre-cast structures.

B. Concrete Forms and Reinforcement Materials shall be as specified in Division 03 Section "Cast-in-Place Concrete".

C. Concrete shall be 3000-psi, 28-day compressive strength as specified in Division 03 Section "Cast-in-Place concrete".

D. Weatherproof concrete pull boxes, junction boxes and telephone boxes shall be manufactured by Christy Concrete Products or equal. All boxes shall have lids marked "Power", "Signal", "Fiber Optic", "Danger-High Voltage", etc. and be traffic-rated per CalTrans drawing ES-8 minimum where pull box occurs in vehicular traffic areas.

2.2 RACEWAYS AND FITTINGS

A. Galvanized rigid steel conduit (GRC) shall meet ANSI C80.1, and be heavy wall, hot dipped galvanized inside and out, with threaded ends, for use with threaded type fittings.

B. Galvanized intermediate metallic conduit (IMC) shall meet ANSI C80.6, be zinc-coated steel and have threaded fittings.

C. Galvanized electrical metallic tubing (EMT) shall meet ANSI C80.3, and be continuous, seamless steel tubing, galvanized or sherardized on exterior, coated on interior with smooth hard finish of lacquer, varnish or enamel, with steel set-screw, steel compression or die-cast compression type fittings. Provide concrete-tight type compression fittings where required and rain-tight wet location listed compression fittings for outdoor locations.

D. Rigid non-metallic conduit (RNC) shall meet NEMA TC 2, be Schedule 40 PVC, suitable for 90°C, with solvent cemented type NEMA TC3 fittings.

E. Flexible metallic conduit (FMC) shall be single strip, continuous, flexible interlocked double-wrapped steel, hot dip galvanized inside and out forming smooth internal wiring channel, with steel, compression type fittings.

F. Liquid-tight flexible metallic conduit (LFMC) shall be same as FMC except with inert sunlight-resistant, mineral-oil-resistant watertight plastic outer jacket. Fittings shall be cast malleable iron body and gland nut, cadmium plated with one-piece brass grounding bushings threaded to interior of conduit. Spiral molded vinyl-sealing ring between gland nut and bushing and nylon-insulated throat.

G. All raceway fittings shall be specifically designed for the raceway type with which used.

2.3 SURFACE MOUNTED RACEWAY

A. Surface Mounted Nonmetallic Raceways and system components shall be composed of U.L. Listed materials and exhibit nonflammable self-extinguishing characteristics. Larger (2 and 3 channel non-metallic raceways) shall be UL Listed under File Nos. E90378 Guide RJTX and E90377 Guide RJYT, respectively. Raceways shall be tested to UL94V-0, or equivalent.

B. Surface Mounted Nonmetallic Raceway shall be a two-piece design with a base and snap-on cover(s). The raceway base shall accept either a single cover that spans the entire base or two individual covers which together cover the base and allow independent access to services.

C. Surface Mounted Nonmetallic Raceway shall be available with two or three wiring channels separated by integral barriers. One channel must be large enough to accept standard power and communication devices without restricting capacity of the adjacent channel. The raceway base and cover shall be manufactured of rigid PVC compound, available in ivory or white.

D. Device brackets shall be available for mounting standard devices in-line or offset from the raceway. A device bracket shall provide up to three single-gang openings at one location. Faceplates shall match raceway and fit flush in the device plate. They shall be manufactured of rigid PVC compound.

E. The raceway manufacturer will provide a complete line of connectivity outlets and modular inserts for UTP, STP (150 ohm), fiber optic, coaxial and other cabling types with faceplates and bezels to facilitate mounting. A complete line of preprinted station and port

identification labels, snap-in icon buttons, as well as write-on station identification labels shall be available.

F. A complete line of full capacity corner elbows and tee fittings must be available to maintain a controlled 2" cable bend radius which meets the specifications for Fiber Optic and UTP/STP cabling and exceeds the TIA / EIA 569-A requirements for communications pathways. They shall be manufactured of a rigid PVC compound.

G. A full complement of fittings must be available including, but not limited to tees, entrance fittings, cover clips, and end caps. They shall be manufactured of a rigid PVC compound. The fittings shall have a matte texture, in ivory or white colors to match the base and cover. They shall overlap the cover and base to hide uneven cuts. All fittings shall be supplied with a base where applicable to eliminate mitering. Transition fittings shall be available to adapt to other raceways.

H. Surface Mounted Nonmetallic Raceway shall be multi-channel 5400 Series by the Wiremold Company, or equal.

2.4 CONDUCTORS

A. All conductors shall be delivered to the site in their original unbroken packages, plainly marked or tagged with UL labels, size, type of wire, type of insulation, name of the manufacturing company and trade name of the wire.

B. All conductors shall be minimum of 98% conductivity soft drawn copper. Conductors #8 AWG and larger shall be stranded type “THHN/THWN”, 600 Volt insulation. Conductors #10 AWG and smaller shall be solid copper “THHN/THWN”, 600 Volt insulation.

C. Insulation shall be Thermoplastic Type rated at 75 degrees C. minimum.

2.5 PULL BOXES AND WIREWAYS

A. Pullboxes and Enclosures for outdoor use shall be NEMA 250, Type 3R or Type 4, unless otherwise noted.

B. Pullboxes and Enclosures for indoor use shall be NEMA 250, Type 1, unless otherwise noted.

C. Wireways shall be constructed in accordance with UL 870 for wireways, auxiliary gutters and associated fittings. Every component including lengths, connectors and fittings shall be UL Listed.

D. Wireways and auxiliary gutters shall have continuous removable cover secured with screws and keyhole slots. Hinged cover shall be provided where installed above suspended ceiling.

E. Fabricated sheet steel pull boxes shall be installed only in dry, protected locations and shall be furnished with knockouts and removable screw cover. Box shall be finished with one coat of zinc chromate and a coat of primer sealer and where exposed to public view shall be painted to match the surrounding surface.

F. Weatherproof sheet steel pull boxes shall be fabricated of code gauge galvanized sheet steel with two coats of rust resistant finish and shall be furnished with gasket and made completely weathertight.

2.6 WIRING DEVICES AND MATERIALS

A. Outlet Boxes shall meet NEMA OS1 and be galvanized code gauge steel. Boxes in masonry shall be square cornered. Boxes exposed to weather or in wet locations shall be Type FD cast metal with external threaded hubs and gasketed cover and shall meet NEMA FB1.

B. Outlet box extensions shall be U.L. listed and shall be attached to box with threaded metal screws.

C. Approved manufacturers of metal boxes are Raco, Crouse-Hinds, Steel City or equal.

D. A/C Snap Switches:

1. 120/277 Volt Switches shall be quiet, fast make, fast break design, toggle handle, with totally enclosed case, rated 20 ampere, heavy duty specification grade. Provide matching two pole, 3-way, 4-way, and key switches as required.

2. A/C snap switches served by emergency power circuits shall be red.

3. A/C snap switches shall be Hubbell or Leviton 1221 series.

E. Receptacles:

1. Duplex Receptacles:

a. Duplex Receptacles shall be tamper-resistant, full gang size, polarized duplex, parallel blade, U-grounding slot, specification grade, rated at 20 amperes, 125 volts and designed for split feed service.

b. Receptacles served by normal power circuits shall be ivory, grey, white or brown, dependent upon room wall finish and as direct by Architect. Receptacles served by emergency power circuits shall be red.

c. Duplex receptacles shall be Hubbell HBL5362WTR series, or equivalent.

2. GFCI Receptacles:

a. GFCI receptacles shall be weather-resistant, tamper-resistant, duplex, feed-through type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle arranged to protect connected downstream receptacles on same circuit. Units shall be designed for installation in a 2-3/4-inch deep outlet box without an adapter.

b. Duplex GFCI receptacles shall be Hubbell #GFTWRST20W series, or equivalent to match regular duplex receptacles.

3. Required Weather-Resistant Receptacles: All 15- and 20-ampere, 125- and 250-volt non-locking type receptacles located outdoors and in damp and wet locations shall be listed weather-resistant type.

4. Required Tamper-Resistant Receptacles: Tamper resistant receptacles shall be provided in the following areas where required by CEC 406.12:

   a. Dwelling units;

   b. Guest rooms and guest suites;

   c. Child care facilities;

   d. Preschool and elementary school education facilities;

   e. Business offices, corridors, waiting rooms and the like in clinics, medical and dental offices and outpatient facilities;

   f. Subset of assembly occupancies described in CEC 518.2 to include places of waiting transportation, gymnasiums, skating rinks and auditoriums;

   g. Dormitories;

5. Receptacles for Owner-furnished equipment shall match that equipment's plug configuration.

6. Other Receptacles: Other receptacles shall match the plug configuration and ratings required for the utilization equipment that is served.

F. Device cover plates shall be provided and installed at all wiring devices, switches, outlets, and similar applications, and shall be as directed by architect. Pull boxes and junction boxes to which no fixture is to be attached shall be fitted with blank cover plates painted to match surrounding. All cover plates installed on rated walls shall be brushed stainless steel. Cover plates for receptacles in wet locations shall have an enclosure that is weatherproof whether or not the attachment plug cap is inserted and shall be identified as "extra-duty". Cover plates installed at switches used for lighting control in all multiple occupant restrooms, all hallways and corridors, and in other locations where lockable cover plates are indicated on the Drawings shall be the dustproof locking stainless steel cover Legrand model WP26-L.

2.7 TERMINAL CABINETS AND CLOSETS

A. Cabinets and fronts shall be in accordance with NEMA Standard Publication No. PB1-1971 and UL Standards No. 67. Fronts shall include doors and have flush, brushed stainless steel, cylinder tumbler-type locks with catches and spring loaded door pulls. The flush lock shall not protrude beyond the front of the door. All locks shall be keyed like the panel board locks. Fronts shall have adjustable indicating trim clamps that shall be completely concealed when the doors are closed. Doors shall be mounted by completely concealed steel hinges. Fronts shall not be removable with the door in the locked position. A frame and card with a clear plastic covering shall be provided on the inside of the door. Fronts shall be of code gauge full finished steel with rust inhibiting primer and baked enamel finish.

2.8 PANELBOARDS

A. Furnish panelboards shown on plans and described herein. All cans shall be a minimum of 20" wide and 5.75" deep unless otherwise shown. They shall be totally flat or equal with flush keyed locks.

B. Fronts shall be cold rolled sheet steel painted with ANSI 61 gray enamel over a rust inhibitor. They shall be equipped with door, flush hinges, and flush proper cylinder tumbler lock, metal circuit card holder, and quarter turn adjustable trim clamps. Panel locks shall be keyed alike.

C. Panel shall consist of reinforced corrosion resistant galvanized sheet steel frame with silver plated copper bus bars and circuit breakers properly supported to prevent vibration breakage in handling. All terminals shall be solderless type suitable for specified conductors of size indicated.

D. Neutral bus shall be full size. Neutral bus shall be 200% rated when supplied from a double neutral feeder. Provide an equipment ground bus in each panelboard. In addition to the equipment ground bus, provide an isolated ground bus when supplied from a feeder which includes an isolated grounding conductor.

E. Branch circuit breakers shall be molded case, bolt-on, and fully interchangeable without disturbing adjacent units. All 2-pole and 3-pole breakers shall have common trips. Circuit breakers supplying Class 1 transformers shall be lockable in the off position.

F. Branch panelboards and overcurrent protection devices shall have a minimum short circuit rating of 10,000 RMS symmetrical AIC (120/208V).

G. Distribution panelboards and overcurrent protection devices shall have a minimum short circuit rating of 42,000 RMS symmetrical AIC (120/208V).

H. All Panelboards shall be fully rated as shown on Drawings; series-rating shall not be allowed.

I. Panelboards shall bear an Arc-Flash Hazard Warning label in accordance with CEC Article 110.16.

J. Breakers for switching lights shall be type SWD, rated for switching duty. Breakers for mechanical equipment shall be HACR type.

K. All spaces shall have hardware.

2.9 DISCONNECTING DEVICES

A. Disconnecting devices shall be provided as shown and/or as required by CEC.

B. Motor-rated switches shall be toggle-type, quick make-quick break, rated 2 HP, 250 VAC, with number of poles as required. They shall be equipped with overload heaters rated for overload protection of loads controlled.

C. Motor-rated switches shall be flush-mounted adjacent to load controlled. Where flush mounting is not possible, switches shall be surface mounted in NEMA enclosure suitable for environment in which installed.

D. Disconnect switches shall be 250V or 600V class, rated heavy-duty, horsepower rated, quick-make, quick-break, dead-front type and provided with proper number of poles.

E. Disconnect Switches shall be self contained in a NEMA 1 gasketed enclosure (NEMA 3R where installed outdoors) and externally operable from the front.

F. Fusible disconnect switches shall be equipped with rejection type clips suitable for UL Class R fuses up to 600A and suitable for UL Class L fuses above 600A. Fuse interrupting rating shall be 200,000 RMS symmetrical amperes.

G. Circuit breakers utilized as disconnecting devices shall comply with the requirements stated in other articles of this section and CEC.

2.10 FUSES

A. Subject to compliance with requirements, provide products by one of the following manufacturers:

1. Bussman

2. Gould Shawmut

3. Littlefuse.

B. Fuses 600 amperes and below shall be UL Class RK1, 200,000 RMS symmetrical amperes interrupting rating.

C. Fuses 601 amperes through 4000 amperes shall be UL Class L, 200,000 RMS symmetrical amperes interrupting rating.

2.11 INDIVIDUAL MOTOR CONTROLLERS:

A. Individual Motor Controllers shall be self contained in NEMA 1 gasketed enclosure (NEMA 3R where installed outdoors) and externally operable from the front.

B. Individual Motor Controllers shall be full-voltage non-reversing (FVNR) type combination magnetic starters for motors of ½ HP to 60 HP. Individual Motor Controllers shall be reduced voltage, non-reversing, autotransformer type combination magnetic starters for motors 75 HP and larger.

2.12 MAGNETIC STARTERS FOR MECHANICAL EQUIPMENT

A. All magnetic starters for mechanical equipment shall be furnished with integral 120VAC control transformers, sized to handle the starter and all controls connected to it – pilots, EP valves, etc.

B. All magnetic starters for mechanical equipment shall be provided with auxiliary contacts as required for interlock to EMS System. An allowance of at least one auxiliary contact per starter shall be estimated.

2.13 SUPPORTING DEVICES

A. Supporting devices shall be constructed of cold-formed steel, with a corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal items for use outdoors or in damp locations shall be hot-dipped galvanized steel.

C. Slotted-steel channel supports shall have flanged edges turned toward the web, and 9/16-inch diameter slotted holes at a maximum of 2 inches on center, in the web.

1. Channel thickness shall be selected to suit structural loading.

2. Fittings and accessories shall be products of the same manufacturer as the channel supports.

D. Raceway and cable supports shall be manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

E. Pipe sleeves shall be ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, with plain ends.

F. Cable supports for vertical conduit shall be a factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Plugs shall have number and size of conductor gripping holes as required to suit individual risers. Body shall be constructed of malleable-iron casting with hot-dip galvanized finish.

G. Concrete anchors shall be steel bolts with expansion anchors requiring a drilled hole. Powder driven anchors are not acceptable.

H. Toggle bolts shall be all-steel springhead type.

2.14 ELECTRICAL IDENTIFICATION

A. Identification devices shall be a single type of product for each application category. Colors shall be as prescribed by ANSI A13.1, CEC, and these Specifications.

B. Raceway and cable labels shall comply with ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway and cable size.

1. Pre-tensioned, wraparound plastic sleeves shall be a flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the item it identifies.

2. Preprinted, flexible, self-adhesive, vinyl labels shall have a legend, over-laminated with a clear, weather- and chemical-resistant coating.

3. Color shall be black letters on orange background.

4. Legend shall indicate voltage.

C. Self-adhesive colored marking tape for raceways, wires and cables shall be vinyl tape, not less than 1 inch wide by 3 mils thick.

D. Underground Warning Tape shall be vinyl tape, compounded for permanent direct-burial service, not less than 6 inches wide by 4 mils thick, embedded with a continuous metallic strip or core, brightly-colored, continuously-printed with a legend that indicates the type of underground line.

E. Tape markers for wire shall be vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

F. Color-coding cable ties shall be made of Type 6/6 nylon, be self-locking type and of colors to suit coding scheme.

G. Engraved plastic labels, signs and instruction plates shall be made from black (or red as noted) Bakelite laminate engraving stock with a white core, punched or drilled for mechanical fasteners. It shall have a minimum thickness of 1/16-inch for signs up to 20 sq. in. and a minimum thickness of 1/8-inch for larger sizes.

H. Interior Warning and Caution signs shall comply with 29 CFR, Chapter XVII, Part 1910.145 and shall be preprinted, aluminum, baked-enamel-finish signs, punched or drilled for mechanical fasteners, with colors, legend, and size appropriate to the application.

I. Exterior Warning and Caution signs shall comply with 29 CFR, Chapter XVII, Part 1910.145 and shall be weather-resistant, non-fading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch, galvanized-steel backing, with colors, legend, and size appropriate to the application. They shall be equipped with 1/4-inch grommets in each corner for mounting.

J. Fasteners for nameplates and signs shall be self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

K. Arc-Flash Hazard Warning labels shall be provided at electrical equipment such as switchboards and panelboards in accordance with CEC 110.16.

L. Circuit Identification – A typewritten circuit directory shall be provided at each panelboard and switchboard in accordance with CEC Article 408.4(A). The Contractor shall develop and prepare the circuit identification description based on the as-built condition.

M. Source of Supply Identification – All switchboards, panelboards and transformers shall have a typewritten label applied indicating the device or equipment where the power supply originates per CEC Article 408.4(B).

2.15 TOUCHUP PAINT

A. Touch-up paint shall be equipment manufacturer's paint selected to match installed equipment finish.

B. Touch-up paint on galvanized surfaces shall be zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL INSTALLATION

A. All material, equipment, devices, etc., shall be installed in accordance with the recommendations of the manufacturer of the particular item. The Contractor shall be responsible for all installations contrary to the manufacturer's recommendations. The Contractor shall make all necessary changes and revisions to achieve such compliance. Manufacturer's installation instructions shall be delivered to and maintained at the job site throughout the construction of the project.

B. The layout and installation of electrical work shall be coordinated with the overall construction schedule to prevent delay in completion of the project.

C. Dimensions and information regarding accurate locations of equipment and structural limitations and finish shall be verified with other sections.

D. The drawings do not show all raceway, wiring, offsets, bends, special fittings, junction or pull boxes necessary to meet job conditions. Items not shown as indicated, where are clearly necessary for proper operation or installation of systems shown, shall be provided as required, at no increase in contract price.

E. Materials and Components shall be installed level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

F. Electrical equipment, outlets, junctions and pull boxes shall be installed in accessible locations, avoiding obstructions, preserving maximum headroom, and keeping openings and passageways clear.

G. Equipment shall be installed to facilitate service, maintenance, and repair or replacement of components. It shall be connected for ease of disconnecting, with minimum interference with other installations. Minor adjustments in the locations of equipment shall be made where necessary providing such adjustments do not adversely affect function of the equipment. Major adjustments for the location of equipment shall be previously approved and detailed on the Record Drawings.

H. Right of Way shall be given to raceways and piping systems installed at a required slope.

3.2 PRECAST CONCRETE PULL BOXES AND MANHOLES

A. Contractor shall provide a minimum of 3-6" of sand base material suitable to receive the pullbox or manhole. The base material shall be compacted and graded level at proper elevation to receive the pullbox or manhole in relation to the conduit grade or ground cover requirements as designated in the plans.

B. Sealants used between the joints of the pullbox or manhole are at the Contractor's discretion unless otherwise specified. If grout is used, it should consist of two parts plaster sand to one part cement with sufficient water added to make the grout flow under its own weight. The grout should be poured into a water soaked groove and filled to the top of the groove unless a double amount is to be used as a further precaution against leakage. In this case, the mastic sealant should be placed on the two shoulders of the

groove. The next section of pullbox or manhole should be placed while the foaming action is in process. Contractor shall verify grades with the Engineer and shall set holes and boxes level at proper grades.

C. All conduits penetrating the pull box or manhole shall have seals to prevent water from entering the raceway.

3.3 RACEWAY APPLICATION

A. Wiremold 5400 Series two-channel surface non-metallic raceways shall be used only where indicated on the plans.

B. Galvanized Rigid Steel Conduit (GRC) **may** be used in all locations. Where installed in direct contact with earth, conduit shall be wrapped with two layers of half-lapped 10-mil PVC tape for a total thickness of 40-mil or have a factory applied 40-mil PVC coating.

C. Galvanized Rigid Steel Conduit (GRC) **shall** be used where exposed to physical damage, indoors where exposed to moisture, in exposed outdoor installations, in systems higher than 600 volts, and where required by code.

D. Galvanized Intermediate Metallic Conduit (IMC) **may** be used in indoor locations not in direct contact with earth.

E. Galvanized Electrical Metallic Tubing (EMT) may be used in dry indoor locations according to the following criteria:

1. It is not subject to physical damage.

2. It is not in direct contact with earth.

3. It is not in concrete slabs.

4. It is not in a hazardous area.

F. Rigid Non-Metallic Conduit (RNC) Schedule 40 PVC **may** be used underground or below concrete slabs on grade. Rigid Non-Metallic Conduit (RNC) Schedule 80 PVC **may** be used to pass through concrete slabs. Rigid Non-Metallic Conduit (RNC) **may** be used in compliance with utility company requirements for utility service conduits. Rigid Non-Metallic Conduit (RNC) **shall not** be installed above grade or above finished floor level.

G. Liquid-tight Flexible Metallic Conduit (LFMC) **may** be used in all locations to make final connections to motors, transformers, or other mechanical equipment (not to exceed 24 inches in length) or lighting fixtures (not to exceed 72 inches in length). Where specifically approved by the Engineer, LFMC may be used to facilitate wiring in tight locations or in other conditions that make the use of other conduit impracticable.

H. Flexible Metallic Conduit (FMC) **may** be used in dry locations to make final connections to motors, transformers, or other mechanical equipment (not to exceed 24 inches in length) or lighting fixtures (not to exceed 72 inches in length). Where specifically approved by the Engineer, FMC may be used to facilitate wiring in tight locations or in other conditions that make the use of other conduit impracticable.

3.4 RACEWAY INSTALLATION

A. General

1. Expansion joints shall be provided at building expansion joints or as required due to length of run or difference in temperatures.

2. All fittings that are exposed or in damp areas shall have sealing glands and proper gasket.

3. In general, all conduits shall be sloping to drain. Bends that place a trap in a conduit shall be avoided. Provided drip fitting as required. Dux-Seal high ends of all underground raceways.

4. All conduit runs shall be mechanically and electrically continuous from outlet to outlet. Conduit size or type shall not be changed between outlets.

5. All empty raceways shall be equipped with pull lines, capped and labeled. Pull lines shall be 3/16" polypropylene, No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 24 inches of slack with identification tag at each end of the pull wire.

6. Minimum size of any conduit for lighting, power and signal shall be ¾" conduit unless shown otherwise.

7. Use temporary raceway caps to prevent foreign matter from entering. Immediately prior to installation of conductors, conduit shall be blown and swept free of foreign materials. All conduit stubs for future, both above and below grade, shall be capped. Run conduits for spare panelboard circuits to attic or accessible spaces.

8. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

9. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.

10. There shall be no more than the equivalent of four quarter bends (360-degrees total) between pull points such as pull boxes, outlet boxes or conduit bodies, in one run of conduit.

11. Install raceways and cables at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.

12. Conduits shall be securely fastened to building structure at intervals not greater than ten feet.

13. Conduit shall be square cut and reamed if required to full size, with thread full cut and true.

14. Conduits shall be jointed by approved couplings with ends of conduits tightly butted. Non-insulating compound shall be used in making up joints below grade or inside on grade to insure a watertight system.

15. Conduit connections to outlet boxes or cabinets shall be made with approved connectors, using locknuts and insulated throat bushings.

16. Complete raceway installation before starting conductor installation.

17. Contractor shall provide rubber grommets to fasten galvanized conduit to exterior structures made of dissimilar metals at all exterior locations to prevent galvanic corrosion.

18. Contractor shall provide rubber grommets to fasten galvanized conduit to supports which are also used by other systems utilizing piping of dissimilar metals to prevent galvanic corrosion.

B. Interior

1. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.

2. All concealed conduits shall be installed in as direct a line as possible between outlets. No more than four quarter bends, or their equivalent, will be allowed between outlets. Feeder conduits shall follow arrangement shown on plans unless a change is authorized. Branch circuit conduits shall, in general, follow arrangement as shown as far as structural conditions permit. All exposed runs shall parallel buildings, walls, or partitions, and be supported on Kindorf Hangers to meet Title 24, Part 3, CEC.

C. Exterior

1. Exterior conduit including the sweep below grade and the vertical riser shall be galvanized rigid steel conduit, except where rigid non-metallic conduit is required for utility service conduits by the serving utility company.

2. No rigid non-metallic conduit (RNC) shall be installed above grade.

D. Underground

1. Two or more power **or** telecommunications conduit runs installed in a common trench shall be separated horizontally by a minimum of four inches (4”).

2. Two or more power **and** telecommunications conduit runs installed in a common trench shall be separated horizontally by a minimum of twelve inches (12”).

3. **All** electrical conduit runs installed in a common trench with other utility company lines, plumbing pipes, or heating pipes shall be separated horizontally from such lines by a minimum of twelve inches (12”).

4. Conduits installed underground and not under buildings shall have a minimum of 24” of cover over the top of the conduit.

5. Utility service conduits shall be installed according to the serving utility’s requirements for material, depth of cover, and separation.

6. Rigid non-metallic conduit shall be laid on excavated firm bed, sealed watertight and unless with 24 inch earth cover, shall have 3 inch minimum concrete encasement unless under concrete. Plastic conduit without encasement shall be random lay, “snaked”, not pulled tight. Plastic conduit laid in areas of reinforcing

steel shall be supported independently at each threaded fitting. Plastic conduit joints shall be full solvent welded.

7. Rigid non-metallic conduit installed underground and not below a building slab shall have a galvanized rigid steel long radius elbow installed at the terminating end where the transition from horizontal to vertical occurs.

E. In Concrete Slabs

1. Conduit installed within concrete slabs shall be Schedule 80 PVC rigid non-metallic conduit or full weight galvanized rigid steel conduit.

2. Conduits in concrete slabs 3 inches thick or less shall not be of size larger than ¾ inch nominal trade size, and wired to top of reinforcing steel.

3. Conduit installed in concrete slabs shall be installed in the middle third of the slab thickness where practical, and have at least 1-inch concrete cover.

4. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.

5. Conduit installed in concrete slabs shall be installed side-by-side horizontally and shall have no less than 1" spacing between each conduit to allow for concrete consolidation to prevent voids in the concrete. Conduits that are installed in concrete slabs shall be arranged such that they do not cross over other conduits within the concrete slab. Where crossing of conduits is unavoidable the crossing sets of conduits shall be installed below the slab. No more than 3 conduits shall be installed side-by-side in a concrete slab without special permission from the structural engineer.

6. Install conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.

7. Contractor shall be responsible for damages to membrane and shall repair it.

F. Below Grade Level Concrete Building Slab

1. All conduits below the building slab shall be Schedule 40 PVC rigid nonmetallic conduit or full weight galvanized rigid steel conduit, and shall have a 6" minimum cover below the floor slab measured from the bottom of the floor slab to the top of the conduit.

2. Rigid non-metallic conduits that are 1" trade size or smaller that are installed below the building slab shall transition from Schedule 40 PVC below the building slab to Schedule 80 PVC rigid nonmetallic conduit or galvanized rigid steel conduit, before passing into the concrete building slab and shall transition to galvanized rigid steel conduit or IMC within the concrete building slab before exiting and rising above the building slab.

3. Rigid non-metallic conduits that are 1 ¼" trade size or larger that are installed below the building slab shall have a galvanized rigid steel long radius elbow installed at the terminating end where the transition from horizontal to vertical occurs and the vertical riser shall be galvanized rigid steel conduit rising above the building slab.

4. Rigid non-metallic conduit installed underground and not below a building slab.

5. Where conduits rise through the building slab they shall be installed at sufficient depth so that the curved portion of any bends, sweeps, or 90's are not visible above the finished slab.

6. Contractor shall be responsible for damages to membrane and shall repair it.

G. Signal Systems

1. Install telephone and signal system raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent.

2. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

H. In Beams and Footings

1. Conduit in concrete beam and footings shall be perpendicular to direction of beams unless otherwise indicated on structural drawings.

2. Conduit shown in concrete beam parallel to beams shall be installed at approximate mid-depth of beam.

I. Flexible Conduit

1. LFMC or FMC shall be used to connect motors and equipment subject to vibration, noise transmission, or movement to junction boxes, with a maximum length of 24-inches.

2. Install separate ground conductor across flexible connections.

3. Flexible conduits shall be independently suspended.

3.5 SURFACE MOUNTED RACEWAY INSTALLATION

A. Surface Mounted Raceways shall be used only in dry interior locations, as allowed in Article 388 (Surface Nonmetallic Raceways) of the California Electrical Code.

B. Surface Mounted Raceways and wire distribution systems shall contain no more than six current carrying conductors in each section or compartment. Where additional conductors are required, additional raceway shall be installed to accommodate additional conductors.

3.6 METAL CLAD CABLE – INSTALLATION

A. Install metal clad cable in accordance with manufacturer's instructions and in strict accordance with CEC Article 330. Follow manufacturer's explicit instructions when connecting the cable to fittings and boxes. Connectors shall be firmly secured to the cable, but not over tightened. Connector shall be firmly attached to metal boxes.

B. Support metal clad cables every 6 feet and within 12 inches of boxes, per CEC Article 334, using separate spring metal clip or metal cable ties (not steel tie wire) for each cable. Metal clad cables shall not be bundled together.

C. Suspended ceiling drop wire may be used to directly support a maximum of two separate metal clad cables.

D. Provide separate drop wire above accessible ceiling, to support more than two metal clad cables.

E. Do not rest metal clad cables on ceiling tiles or allow contact with mechanical piping systems.

F. Bend metal clad cable per CEC Article 334.

G. Provide separate sleeves and/or fire barriers where metal clad cable penetrates firewalls, unless cable is UL listed for the application.

3.7 CONDUCTOR APPLICATION

A. Feeders and branch circuits shall be Type THHN/THWN insulated conductors in raceway.

B. Underground feeders and branch circuits shall be Type THWN or single-wire, Type UF insulated conductors in raceway.

C. Branch circuits for other than lighting circuits shall be Type THW or THHN/THWN insulated conductors in raceway. Lighting branch circuits shall be Type THW or THHN/THWN insulated conductors in raceway where exposed and may be metal-clad cable where concealed in ceilings and gypsum board partitions.

D. ”Minimum conductor size shall be #12 for power and lighting, #14 for 120V control circuits and #18 for 24V control circuits.

E. Remote control, signaling and power-limited circuits shall be Type THHN/THWN insulated conductors in raceway for Classes 1, 2, and 3, unless otherwise indicated.

3.8 CONDUCTOR INSTALLATION

A. Conductors shall be continuous from outlet to outlet, no splices shall be made except within outlet or junction boxes.

B. Wiring at outlets shall be installed with at least 12 inches of slack conductor at each outlet.

C. Outlet and component connections shall be made to wiring systems and to ground. Electrical connectors and terminals shall be tightened according to manufacturer’s published torque-tightening values. Torque values specified in UL 486A shall be used where manufacturer’s torque values are not indicated.

D. Wire in panels, cabinets, pull boxes, and wiring gutters shall be squared, labeled, and neatly grouped with cable ties and fanned out to the terminals.

E. All branch circuits, fixture wiring joints, splices, and taps for conductors #10 and smaller shall be made with 3M “Scotchlock” connectors, or approved equal.

F. All branch circuits, fixture wiring joints, splices, and taps for conductors #8 and larger shall be made with two-bolt type solderless connectors or T & B “color keyed” compression lugs.

G. Bolt-type solderless connectors shall be torqued with a torque wrench according to the manufacturer’s recommendations, and then retightened after 24-48 hours before taping. Owners’ inspector shall be informed of this procedure during the waiting period and shall witness the act of retightening.

H. Connectors and lugs for terminating stranded conductors #8 and larger shall be machine crimp compression type.

I. All splices shall be taped with Scotch #88 plastic electrical tape with “Scotch Fill” where necessary for a smooth joint. Scotch #27 or #2520 shall be used for other than normal temperatures or conditions. All connections and splices shall be electrically perfect and in strict accordance with all code requirements.

J. No splices shall be made below grade in a manhole or pullholes without Engineer’s written approval, and then shall be encapsulated with 3M potting kits per 3M Specifications. For larger gauge wire where 3M potting kits are prohibited Contractor shall use submersible UL listed Polaris connectors by NSi.

3.9 WIREWAY AND AUXILIARY GUTTER APPLICATION

A. Wireways and auxiliary gutters shall be used above and below panelboards, lighting relay cabinets, and terminal cabinets to accommodate large concentrations of wires.

3.10 PULL BOXES AND WIREWAYS:

A. Boxes shall be installed square and plumb. An engraved nameplate shall be installed on each box indicating its function. Nameplate shall be installed on the exterior of each box in unfinished areas and on the interior of each box in finished areas.

B. Wireways shall be installed with strip-type connectors with self-retained mounting screws. Hangers with two piece, hook together features shall be used to permit preassembly of wireway and hanger bottom plate before hanging on a preinstalled upper bracket.

C. Pull and junction boxes shall be installed as shown to ease the pulling of wire and to comply with CEC requirements.

3.11 WIRING DEVICES AND MATERIALS

A. Outlets shall be mounted at 18” minimum above finished floor unless otherwise noted.

B. The locations of outlets shown on drawings shall be located with respect to work of others and to be symmetrical with room layout.

C. Outlets in architectural patterned surfaces such as tile and finish panels shall be centered on intersections of four panels or in exact center of panels, unless otherwise shown on architectural plans or directed by Architect.

D. Outlet boxes for concealed work shall be one-piece steel knock out type with zinc coating. Boxes shall not be smaller than 4" square nominal size, unless otherwise indicated. Extension rings, plaster rings, and covers shall be provided as necessary for flush finish.

E. The Contractor shall inform himself of wall thickness throughout the building and shall provide outlet boxes of suitable depth that can be flush mounted and yet will be deep enough to contain the particular apparatus involved. Location of exposed pull or junction boxes will be subject to the Architect's approval.

F. Outlet boxes on opposite sides of walls shall not be placed back-to-back, nor shall "through" boxes be employed (except where specifically permitted on the drawings by note).

G. Switches shall be mounted 48" to top of device box above finished floor unless otherwise noted.

H. Where more than one switch occurs at the same location, use multiple gang outlet boxes covered by a single plate; provide box partitions as required by the CEC.

I. Bar hangers shall be used to support outlet boxes in stud or furred partitions and ceilings. Attachment screws, devices, etc., shall be of the proper type to secure boxes to metal studs complemented by expansion shields to concrete and masonry.

J. All outlet boxes and particularly those supporting fixtures shall be securely anchored in place in an approved manner. Support outlet boxes and fixtures in acoustic ceiling areas from building structures, not from acoustic ceilings. All lighting fixture outlets shall be coordinated with mechanical, architectural, or other equipment to eliminate conflicts and provide a workable, neat installation.

K. Approved knock out holes shall be provided. Outlet boxes from which light fixtures will be suspended shall be equipped with 3/8" fixture studs fastened through from back of box.

L. Surface boxes of the cast metal threaded hub type with suitable gasketed covers shall be used for exposed conduit runs less than 5' above a finished floor or where waterproof boxes are required.

M. Floor boxes shall be adjustable, brass trimmed with carpet flanges where carpet is indicated on architectural drawings.

N. Set floor boxes level and trim after installation to fit flush to finished floor surface.

O. Masonry boxes shall have conduit entrances to rear of box with depth as required to clear masonry.

P. Boxes shall be sized for number of conductors entering box.

Q. Wiring devices shall be securely fastened to the outlet box. Where the outlet box covers are back from the finished walls, the device shall be built out with washers so that it is

rigidly held in place to the box. Metal extenders shall be provided in flammable construction per CEC.

R. All device screw slots shall be left in a vertical orientation.

S. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor and to outlet box with bonding jumper.

T. Connect ground terminal of isolated-ground receptacles to isolated-ground conductor routed to designated isolated equipment ground terminal of electrical system.

3.12 TERMINAL CABINETS AND CLOSETS

A. Terminal cabinets shall be installed level and identified with nameplate per schedule.

B. All conductors in terminal cabinets or closets shall be squared, labeled and secured neatly with wire ties.

C. All terminal cabinets shall be installed with the top of the trim at 6'-0" above the finished floor, unless otherwise indicated on the drawings.

D. Where space permits, terminal cabinets shall be surface mounted where they are not visible to the public.

E. A typewritten directory shall be mounted behind plastic in a metal holder welded to the inside of each terminal cabinet door showing a complete description of terminations in each cabinet.

3.13 PANELBOARDS

A. All panels shall have, in addition to conduit shown on the drawings, two ¾" and three 1" conduits stubbed to nearest accessible attic space.

B. All panels shall be installed with the top of the trim at 6'-0" above the finished floor, unless otherwise indicated on the drawings.

C. Where space permits, panels shall be surface mounted where they are not visible to the public.

D. A typewritten directory shall be mounted behind plastic in a metal holder welded to the inside of each panel door showing circuit numbers and complete description of all outlets on each circuit.

E. Labeling of all circuits at panel boards shall match the exact room names of each of the spaces. Verify exact room names with Owner prior to labeling.

3.14 DISCONNECT DEVICES

A. Thoroughly examine site conditions for acceptance of disconnects switch installation to verify conformance with manufacturer and specification tolerances. Do not commence with installation until all conditions are made satisfactory.

B. Coordinate locations of switches and equipment in the field to provide code required clearances in front of switches and to insure that switches are in sight of the controllers as described in CEC Article 430.

C. Install disconnect switches where indicated on the Drawings.

D. Install fuses in fusible disconnect switches.

E. Include construction channel and mounting hardware as required to support disconnect switch.

F. Provide engraved, machine screw retained nameplate on each disconnect switch. Name plate shall identify equipment and panelboard + branch circuit breaker.

3.15 SUPPORTING DEVICE APPLICATION

A. Hot-dip galvanized materials or nonmetallic channel and angle system components shall be used in damp locations and outdoors.

B. Steel materials shall be used in dry locations.

C. Support clamps for PVC raceways shall be click-type clamp system.

D. Strength of supports shall be adequate to carry present and future loads, times a safety factor of at least four with a minimum of 200-lb design load.

3.16 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4-inch diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, according to the following criteria, unless otherwise noted:

1. Wood – wood screws or screw-type nails.
2. Masonry – toggle bolts on hollow masonry units, expansion bolts on solid masonry units.
3. New Concrete – concrete inserts with machine screws and bolts.
4. Existing Concrete – expansion bolts.
5. Steel – welded threaded studs or spring-tension clamps on steel. Field welding shall comply with AWS D1.1. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
6. Light Steel – sheet-metal screws.
7. Fasteners shall be selected so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.17 ELECTRICAL IDENTIFICATION

A. Each conductor of every system shall be permanently tagged in each panelboard, pull box, J-box, etc., in compliance with the Occupational Safety and Health Administration (OSHA).

B. Brady labels shall be used to identify terminals and destination of feeders, branch circuits, signal and control circuits, etc., at all terminations, junction boxes and pull boxes, and shall be coordinated with the nameplates in all boxes and equipment.

C. All terminals in the switchboards, panels, relays, switches, devices, starter terminals, etc., shall have Brady labels for identification to identify both ends of all wiring.

D. The Contractor shall furnish and install 1" x 3" x 3/32" thick laminated black Bakelite nameplates with a white core (unless specifically shown as red) engraved to produce white letters on black background for all items of electrical equipment, including 2-pole and 3-pole circuit breakers, panelboards, starters, relays, time switches and disconnect switches.

E. All devices shall have their branch circuit identified on the back side of device plate with a permanent type black marker, i.e. CT A-21. Identify panelboard and circuit number from which receptacles are served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

F. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

G. Panels having single-pole circuit breakers shall be provided with typed schedules mounted in welded metal holders behind plastic.

H. Clean surfaces that are to receive self-adhesive identification products before applying.

I. Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.

J. Identify raceways and cables with color banding as follows:

1. Bands: Pretensioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.

2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

3. Colors: As follows:

   a. Fire Alarm System: Red.

   b. Security System: Blue and yellow.

   c. Telecommunication System: Green and yellow.

K. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

L. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches below finished grade. If width of

multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.

M. All power conductors shall be identified in accordance with the following schedule:

1. 120/208V, 3 Phase, 4 Wire System.
   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.
   d. Neutral: White.
   e. Ground: Green
2. 277/480V, 3 Phase, 4 Wire System.
   a. Phase A: Brown.
   b. Phase B: Orange.
   c. Phase C: Yellow.
   d. Neutral: White with a colored stripe or gray.
   e. Ground: Green.

N. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

3.18 FIRESTOPPING

A. Seal all penetrations for work of this section through fire rated floors, walls and ceilings to prevent the spread of smoke, fire, toxic gas or water through the penetration, either before, during, or after the fire. The fire **and** temperature ratings of the penetration assembly shall be at least that of the floor, wall, or ceiling into which it is installed so that the original fire rating of the floor or wall is maintained as required by Article 300.21 of the California Electrical Code (CEC).

B. Where applicable, provide OZ Type CFSF/I and CAFSF/I fire seal fittings for conduit and cable penetrations through concrete and masonry walls, floors, slabs and similar structures. Where applicable, provide 3M fire barrier sealing penetration system, and/or Thomas and Bett Flame Safe Fire Stop System, and/or Chase Foam fire stop system, including wall wrap, partitions, caps and other accessories as required. All manufacturers' instructions and recommendations for installation of sealing fittings and barrier sealing systems.

C. The Contractor shall repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed new structures, surfaces and shall install new fireproofing where existing firestopping has been disturbed. The repair and refinishing of materials and other surfaces shall be by skilled mechanics of the trades involved.

3.19 REFINISHING AND TOUCHUP PAINTING

A. The Contractor shall clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location. He shall follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

B. Damage to galvanized finishes shall be repaired with zinc-rich paint recommended by manufacturer.

C. Damage to PVC or paint finishes shall be repaired with matching touchup coating recommended by manufacturer.

3.20 SYSTEM TESTING AND STARTUP

A. Refer to Specification Section 269500 "Electrical Acceptance Tests" for minimum required systems testing and startup.

END OF SECTION 260500

SECTION 260526
GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections shall form a part of this Section, with the same force and effect as though repeated here.

1.2 SUMMARY

A. This Section includes grounding of electrical systems and equipment and basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.

1.3 SUBMITTALS

A. Submittals for this Section shall be made according to the Conditions of the Contract, Division 01 Specification Sections and Specification Section 260100.

B. Product Data for grounding rods, connectors and connection materials, and grounding fittings.

C. Qualification data for firms specified in "Quality Assurance" Article to demonstrate their capabilities and experience.

D. Field tests and observation reports certified by the testing organization and indicating and interpreting the test reports for compliance with performance requirements.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7, or a full member company of the InterNational Electrical Testing Association (NETA).

1. Testing Agency Field Supervision: Use persons currently certified by NETA or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Comply with UL 467.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Chance: A. B. Chance Co.
2. Erico Inc.; Electrical Products Group.
3. Galvan Industries, Inc.
4. Lyncole XIT Grounding.
5. Raco, Inc.
6. Thomas & Betts, Electrical.

2.2 GROUNDING AND BONDING PRODUCTS

A. Where types, sizes, ratings, and quantities indicated are in excess of California Electrical Code (CEC) requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

2.3 WIRE AND CABLE GROUNDING CONDUCTORS

A. Conform to CEC Table 8, except as otherwise indicated, for conductor properties, including stranding.

1. Material: Copper.

B. Equipment Grounding Conductors: Insulated with green color insulation.

C. Grounding-Electrode Conductors: Stranded cable.

D. Isolated Grounding Conductors: Insulated with green color, yellow striping insulation.

E. Bare Copper Conductors: Conform to the following:

1. Solid Conductors: ASTM B 3.
2. Assembly of Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

2.4 MISCELLANEOUS CONDUCTORS

A. Grounding Bus: Bare, annealed-copper bars of rectangular cross section.

B. Braided Bonding Jumpers: Copper tape, braided No. 30 AWG bare copper wire, terminated with copper ferrules.

C. Bonding Straps: Soft copper, 0.05 inch thick and 2 inches wide, except as indicated.

2.5 CONNECTOR PRODUCTS

A. Grounding connections shall be exothermic welded, bolted clamp terminal, or pressure connector type.

B. Exothermic-Welded Connections shall be provided in kit form and selected per manufacturer's written instructions for specific types, sizes, and combinations of conductors and connected items.

C. Bolted Clamp connectors shall be heavy-duty type.

D. Pressure connectors shall be high-conductivity-plated units.

2.6 GROUNDING ELECTRODES AND TEST WELLS

A. Grounding Rods shall be sectional type; copper-clad steel.

1. Size: 3/4 inch by 120 inches.

B. Plate Electrodes shall be copper, square or rectangular shape. Minimum 0.10 inch thick, size as indicated.

C. Test Wells shall consist of a Christy Concrete Products F8 Box, or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. The conduit system, supports, cabinets, switchboards, etc., and neutral conductors must be permanently and effectively grounded by means of approved ground clamps, in accordance with Title 24 of the California Code of Regulations. The neutral shall only be grounded at the main service location unless specifically noted otherwise on the drawings or required by the California Electrical Code.

B. This Contractor shall exercise every precaution to obtain good contacts at all panel boxes, pull boxes, etc. Where it is not possible to obtain good contacts, the conduits shall be bonded around the boxes with a #6 AWG gauge, THWN wire with ground clamps.

C. Where there is more than one building supplied from a common service, provide a grounding electrode system at each building per CEC 250.50 and connect per CEC 250.32(B)(1).

3.2 APPLICATION

A. General

1. All equipment cases, motor frames, etc. shall be completely grounded to satisfy applicable code requirements.

2. The interior hot and cold water piping and the interior above ground gas piping shall be bonded to the building service equipment per CEC 250.104.

3. Do not use underground gas piping as a grounding electrode.

B. Equipment Grounding Conductor

1. Pull an Equipment Grounding Conductor, insulated green, in **ALL** conduits, both metallic and non-metallic, unless they are designated for telephone or data cables.

2. Each disconnect switch shall have an Equipment Grounding Conductor (lay in wire type) which shall be used for grounding the disconnect enclosure. The ground wire shall continue and be connected to the enclosure of the equipment served.

3. Comply with CEC Article 250 for types, sizes, and quantities of Equipment Grounding Conductors, except where specific types, larger sizes, or more conductors than required by CEC are indicated.

4. Install separate Equipment Grounding Conductor in branch circuit runs from computer area power panels or power-distribution units.

C. Terminal Cabinets

1. Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

A. General: Ground electrical systems and equipment according to CEC requirements, except where Drawings or Specifications exceed CEC requirements.

B. Grounding Rods: Locate a minimum of 1-rod length from each other and at least the same distance from any other grounding electrode.

1. Drive until tops are 2 inches below finished floor or final grade, except as otherwise indicated.

2. Interconnect with grounding-electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make these connections without damaging copper coating or exposing steel.

C. Grounding Conductors: Route along the shortest and straightest paths possible, except as otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

D. Underground Grounding Conductors: Use bare copper wire. Bury at least 24 inches below grade.

E. Metal Water Service Pipe: Provide insulated copper grounding conductors, sized as indicated, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding-clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Do not install a grounding jumper across dielectric fittings. Bond grounding-conductor conduit to conductor at each end.

F. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding-clamp connectors.

G. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

H. Test Wells: One for each driven grounding electrode, except as otherwise indicated. Set top of well flush with finished grade or floor. Fill with 1-inch- maximum-size crushed stone or gravel.

I. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to CEC Paragraph 250.52(A)(3), using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG. Where base of concrete foundation is less than 20 feet in length, coil excess conductor within base of concrete foundation. Bond grounding conductor to reinforcing steel to at least 4 locations, and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.

3.4 CONNECTIONS

A. General: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to assure high conductivity and to make contact points closer in order of galvanic series.

2. Make connections with clean, bare metal at points of contact.

3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.

4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.

5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells. Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding-Wire Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Non-contact Metal Raceway Terminations: Where metallic raceways or metallic sheathed cables terminate at metal housings without mechanical and electrical connection to the housing, terminate each metallic raceway or metallic sheathed cable with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits or sheathed cables at both entrances and exits with grounding bushings and bare grounding conductors, except as otherwise indicated.

E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and grounding rods.

F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Where these requirements are not available, use those specified in UL 486A and UL 486B.

G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by manufacturer of connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

H. Moisture Protection: Where insulated grounding conductors are connected to grounding rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 FIELD QUALITY CONTROL

A. Refer to Specification Section 269500 “Electrical Acceptance Tests” for minimum required testing of Grounding System.

3.6 ADJUSTING AND CLEANING

A. Restore surface features, including vegetation, at areas disturbed by work of this Section. Reestablish original grades, except as otherwise indicated. Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION 260526

SECTION 265113
LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections shall form a part of this Section, with the same force and effect as though repeated here.

1.2 SCOPE

A. The Contractor shall provide, install, connect, commission, test and place into operation a complete lighting system in accordance with the requirements of 2022 California Energy Code, California Code of Regulations Title 24, Part 6, and as herein specified.

B. Basis of Design for lighting system: Lighting systems are primarily based on the use of dimmable LED fixtures as specified herein.

C. Provide lighting fixtures of sizes, types and ratings as indicated by Drawings and Schedules, including, but not limited to, housing, light emitting diode (LED) modules, LED drivers, reflectors, diffusers, emergency lighting units, starters, wiring, accessories, poles, pole bases and mounting hardware.

1.3 DEFINITIONS

A. A **Fixture** is a complete unit, exit sign, or emergency lighting unit. Fixtures include LED modules or lamps, as specified, and parts required to distribute light, position and protect LED modules, and connect and disconnect LED modules to and from the power supply.

B. An **Emergency Lighting Unit** is a fixture with integral emergency battery-powered supply and the means for controlling and charging the battery. It is also known as an emergency light set. Emergency lighting units include ones with and without integral LED or lamp heads.

1.4 DESIGNATION

A. Unless otherwise shown on the plans, fixture type designation for an individual fixture shall be typical for similarly indicated fixtures within the entire room or defined area.

B. Unless otherwise shown on the plans, fixtures mounted in a continuous row shall be of the same type as any individually designated fixture within the row.

C. Where a fixture is undesignated on the plans, it shall be of the same type as fixtures of similar function within the room it is located or within similar rooms or areas.

1.5 COORDINATION

A. Confirm compatibility and interface of other materials with luminaires and ceiling system. Report discrepancies to the Architect or Electrical Engineer, and defer ordering until clarified.

B. Supply plaster frames, trim rings, and back boxes to other trades.

C. Coordinate with Division 21-25 to avoid conflicts between luminaries, supports, fittings, and mechanical equipment.

D. All fixtures shall be coordinated with the architectural reflected ceiling plan. If any discrepancies occur, the Architect or Electrical Engineer must be notified in writing before installation is started.

1.6 SUBMITTALS

A. Submittals for this Section shall be made according to the Conditions of the Contract, Division 01 Specification Sections and Specification Section 260100.

B. Product Data

1. Submit complete list of fixtures and manufacturer's catalog cuts and installation instructions on each type of lighting fixture and component. Include data on LED modules, LED drivers, poles, accessories and finishes. Include details indicating compatibility with ceiling grid system.

2. Submit outline drawings indicating dimensions and principal features of fixtures and poles.

3. Submit manufacturer's data on lighting control equipment and components. Include complete wiring diagrams, with wiring types and any installation limitations.

4. Submit battery and charger data for emergency lighting units.

C. Shop Drawings

1. Submit layout drawings of all non-standard or customized fixtures. Drawings shall include mounting and feed points and methods.

2. Submit wiring diagrams detailing wiring for control system specific to this Project and showing both factory-installed and field-installed wiring, and differentiating between factory-installed and field-installed wiring.

D. Operation and Maintenance Data

1. Submit operation and maintenance data for lighting control devices to include in maintenance manuals specified in Division 01 and Specification Section 260100.

1.7 QUALITY ASSURANCE

A. Nothing in these Drawings or Specifications shall be interpreted as to permit any device, system, or work that is not in compliance with the 2022 California Code of Regulations. Where work is detailed and/or specified to a more restrictive standard or higher requirement, that standard or requirement shall govern such work. Applicable codes and regulations include, but are not limited to, the following:

1. Fixtures and emergency lighting units shall be certified by the manufacturer as meeting efficiency requirements prescribed under the test methods of the current California Code of Regulations Title 20, Appliance Efficiency Regulations.

2. All work, commissioning and testing shall fully comply with the 2022 California Energy Code.

1.8 WARRANTY

A. The **Special Warranties** specified in this Article shall not deprive the Owner of other rights the Owner may have under 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 for Batteries

1. Submit a written warranty executed by the manufacturer agreeing to replace (includes material and labor) rechargeable system batteries that fail in materials or workmanship within the specified warranty period.

2. The Special Warranty Period shall be manufacturer's standard but not less than 10 years after date of Completion. Full warranty shall apply for first year, and prorated warranty for last 9 years.

C. Special Warranty for Exterior Fixtures

1. Submit a written warranty signed by manufacturer and installer agreeing to replace external parts of lighting fixtures exhibiting a failure of finish within specified warranty period.

2. Failure of finish is defined as perforation or erosion of finish due to weathering or fading, staining, and chalking of finish color due to effects of weather and solar radiation.

3. The Special Warranty Period shall be five years from date of Substantial Completion.

D. Special Warranty for LED Modules and Drivers

1. LED modules and drivers shall be provided with a five year warranty including labor charges for replacement of defective LED modules and drivers.

PART 2 - PRODUCTS

2.1 FIXTURES (General)

A. The fixtures described in the Lighting Fixture Schedule on the drawings are to be used as a standard of quality to be maintained. Substitute items of same function, performance, and appearance are acceptable in conformance with Section 260100, except where noted otherwise.

B. Provide fixtures complete with all fittings, LED modules, drivers, stems, hangers, and component parts to make a complete installation. Fixtures shall have a suitable interior means of grounding the enclosure.

C. All attaching devices for recessed or surface mounted fixtures mounted in the ceiling shall be of formed or rolled steel and of sufficient strength to prevent movement of fixture after installation.

D. The Architect, Electrical Engineer or Owner shall have the right to reject any damaged fixture, including any fixture with damaged or cracked finishes, broken or bent metal, damaged or broken lenses. Any fixture with an appearance deemed to be abnormal, may also be rejected by the Architect, Electrical Engineer or Owner. Rejected fixtures shall be removed and replaced with an undamaged fixture at no cost to the Owner.

E. Lenses shall be virgin acrylic, 0.125 inches thick minimum, unless otherwise noted.

F. There shall be no visible trademarks or monograms on the lighting fixtures.

G. The Contractor shall provide lay-in frames for all exposed “T” ceiling systems and flanged trims for plasterboard, spline or metal lathe and plaster ceiling systems. The Contractor shall provide plaster or mounting frames where required.

H. Doors, frames, and other internal access shall be smooth operating, free from light leakage under operating conditions, and arranged to permit re-lamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during maintenance and when secured in operating position.

I. Minimum reflectance of reflecting surfaces shall be as follows, except as otherwise indicated:

1. White Surfaces - 85 percent.

2. Specular Surfaces - 83 percent

3. Diffusing Specular Surfaces - 75 percent

4. Laminating Silver Metallized Film - 90 percent

J. Fixtures installed in non-hazardous locations shall conform to UL 1598.

K. Light emitting diode (LED) equipment used in fixtures shall conform to UL 8750.

L. Exposed hardware shall be stainless steel.

2.2 LED FIXTURES

A. LED Modules

1. Color Temperature: 4,000 Kelvin (K)

2. Color Rendering:

a. Indoor Fixtures: 80 CRI, or greater

b. Outdoor Fixtures: 70 CRI, or greater

3. Dimming: LED modules shall be compatible with the 0-10VDC dimmable LED driver.

4. Light Distribution: As indicated on Lighting Fixture Schedule

5. Rated Life: 60,000-hours, with 90-percent lumen maintenance at 50-degrees C, in accordance with TM-21-11.

B. LED Drivers

1. LED Drivers shall be 0-10VDC dimmable and shall be compatible with the LED modules and provide the correct 0-10VDC control voltage.

2. LED Drivers shall be independently tested by Intertek and shall bear the ETL Listed Mark as proof of meeting the applicable published safety standards.

3. LED Drivers shall be independently tested and certified by Underwriters Laboratories (UL) to meet FCC Regulations Part 15 and Part 18 and NEMA standards regarding electromagnetic and radio frequency interference, shall bear the United States UL Listed Mark as proof of meeting the applicable published standards.

4. LED Drivers shall comply with ANSI C62.41, Category A and IEEE 587 standards regarding harmonic distortion and surge protection. Total Harmonic Distortion (THD) shall not exceed 20 percent.

5. LED Drivers shall comply with IEC standard 60929, Annex E and shall source no more than 2mA of control current at 0-10VDC.

6. LED Drivers shall be solid-state, electronic, high power factor (minimum 0.9).

7. LED Drivers shall have a Class A sound rating.

8. LED Drivers shall have internal thermal protection to limit driver case temperature to a maximum of 75-degrees C.

9. Ambient Operating Temperature Range: -40-degrees C to 55-degrees C.

10. Rated Frequency: 60-Hertz

11. Rated Life: 60,000-hours

C. Quality Control

1. Testing and measurement of LED lighting fixture performance shall comply with IES LM-79-08 and IES LM-82-12.

2. Testing and measurement of LED and LED module lumen maintenance shall comply with IES LM-80-08.

2.3 NLIGHT ENABLED NETWORK LIGHTING FIXTURES

A. Lighting fixtures specified as nLight enabled shall have an integral nLight network interface and be integrated into the nLight network lighting control system.

2.4 EXTERIOR FIXTURES

A. Metal parts of exterior fixtures exposed to weather conditions shall be constructed of cast or spun aluminum, cast bronze, stainless steel or other nonferrous metals available to withstand exposure.

B. Steel fixtures installed in damp or wet locations shall have zinc-chromate or equal primer.

C. Provide gaskets on all trims and housings.

D. All exterior fixtures shall be supplied by a branch circuit that is controlled by an astronomic time clock that is programmed to automatically turn lights off during daylight hours.

2.5 EXIT SIGNS

A. Exit signs shall conform to UL 924.

B. Sign Colors and Minimum Letter Height shall be per local code.

C. Exit signs shall include arrows as indicated.

D. Exit signs shall have an integral emergency battery pack and shall include an integral automatic charger in a self-contained power pack. Battery shall be sealed, maintenance-free, nickel-cadmium type with special warranty. Charger shall be fully automatic, solid-state type with sealed transfer relay.

E. Lamps for AC operation shall be light emitting diodes with 20,000 hours minimum rated lamp life.

F. Operation: Relay automatically energizes lamp from unit when circuit voltage drops to 80 percent of nominal or below. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.

2.6 EMERGENCY LIGHTING UNITS

A. Emergency Lighting Units shall conform to UL 924.

B. Emergency Lighting Units shall be self-contained with sealed, maintenance-free, lead-acid type battery with minimum 10-year nominal life and special warranty. Charger shall be minimum 2-rate, fully automatic, solid-state type, with sealed transfer relay.

C. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent on nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. Relay disconnects lamps and battery and automatically recharges and floats on trickle charger when normal voltage is restored.

D. Where indicated, provide heavy-chrome-plated wire guard arranged to protect lamp heads or fixtures.

E. Provide time-delay relay in emergency lighting unit control circuit arranged to hold unit ON for fixed interval after restoration of power after an outage. Provide adequate time delay to permit HID lamps to restrike and develop adequate output.

2.7 EMERGENCY LED DRIVERS

A. Emergency LED Drivers shall conform to UL 924

B. Emergency LED Drivers shall be self-contained, modular, battery-inverter unit factory mounted within fixture body. Battery shall be sealed, maintenance-free, nickel-cadmium type with minimum 10-year nominal life. Charger shall be fully automatic, solid-state, constant-current type.

C. Emergency LED Drivers shall be provided with test switch and LED indicator light visible and accessible without opening fixture or entering ceiling space.

D. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Relay disconnects lamp and battery and automatically recharges when normal voltage is restored.

2.8 POLES

A. Light standards shall be as specified on the Lighting Fixture Schedule. Where a color is specified a powder coating and over galvanizing finish shall be applied.

B. Poles shall have provisions for bonding to ground and shall be bonded to the equipment grounding conductor run with the supply branch circuit.

2.9 WET AND DAMP LOCATIONS

A. All lighting fixtures installed in damp locations shall have UL approved “wet” or “damp” location labels visible in interior of fixtures.

B. All lighting fixtures installed in wet locations shall have UL approved “wet” location labels visible in interior of fixtures.

PART 3 - EXECUTION

3.1 LIGHTING FIXTURES INSTALLATION

A. Continuous runs of fixtures shall be installed straight and true.

B. All new fixtures shall be securely anchored to prevent any possible chance of their falling.

C. The Contractor shall coordinate outlets with Acoustic Tile Contractor and other trades and locate outlets in center or at intersections of acoustical tile in all acoustical tile ceilings. All fixtures must be kept 1 ½” clear of all acoustic tile and any combustible

material by use of approved spacers, unless Fire Underwriters approved to be surface mounted.

D. All fixtures mounted in or on suspended ceilings shall be fastened to the ceiling framing members in accordance with CEC 410.36(B).

E. Recessed fixtures shall be complete with plaster frames, supporting brackets and hanger wires.

F. When lighting fixtures are equipped with integral emergency battery packs the fixtures shall be wired so that all lamps switch on and off via the room light switch and the emergency lamps are automatically energized if the normal power has failed.

G. Install equipment level and plumb and according to manufacturer's written instructions.

H. Mounting heights indicated are to bottom of unit for suspended devices and to center of unit for wall-mounted devices.

I. Fixture installation shall conform to all applicable standards for installation, mounting, wiring, and quality.

J. All fixtures shall be grounded and bonded in accordance with applicable codes. Where fixtures are installed in rows, a bonding screw shall be used to maintain bonding integrity from fixture to fixture.

K. All fixtures, lenses, and other trim shall be aligned, cleaned, free of paint and blemishes before final acceptance.

L. Fixtures weighing more than 50 pounds shall be supported independent of the fixture box. All outlet boxes shall be able to support a minimum of eight pounds.

M. For fixtures weighting more than two pounds, support shall be provided at all four corners, plus the outlet box. Each support shall be able to carry a minimum of four times its intended load.

N. No support or insert, except pendant canopies, shall be visible from the floor.

O. Where fixtures are pendant suspended, the use of ball aligner and canopies at ceiling and fixture, stem, and other required mounting devices shall be required for installation as required to meet Title 24 requirements. A safety cable anchored to the roof structure shall be installed in all pendants. If any obstruction within the 45 degree swing of the fixture exists, the Contractor shall provide a State approved restraint system to prevent the fixture from swinging into the obstruction.

P. When fixtures are stem mounted, the variation in distance from the finished floor shall vary no more than ½" from the heights as specified on the plans.

Q. Pendant-Mounted fixtures mounting heights shall be to the bottom of the fixture. Mounting heights of the wall-mounted fixtures shall be to the center of the outlet box unless otherwise noted.

R. Provide surface-mounted fixtures with UL approval for direct mounting on the various ceilings, unless specified otherwise. Spacers will not be approved.

S. All fixtures shall be supported directly to building structural members or from bridging attached to the structural members, or shall have positive attached structural angles, and/or all-thread rod extensions from structure to ceiling plane. Fixtures and supports shall be laterally braced independently from suspended ceilings (hard or T-bar) utilizing structural angles at approximate 45° angles in two planes from ceiling plane to structure above. Minimum rod size shall be ½" and minimum angle size shall be ¾" x ¾" x 3/16" unless noted otherwise in specific details. Provide all necessary blocking and hardware so that fixtures hang true, square, plumb, and in proper alignment.

T. Recessed fixtures in T-bar ceilings (CCR Title 24, part 2, Section 1616A.1.20)

1. All light fixtures shall be attached positively to the ceiling suspension systems by mechanical means per CEC Article 410.36 to resist a horizontal force equal to the weight of the fixture. A minimum of two screws or approved fasteners are required at each light fixture, per ASTM E580, Section 5.3.1.

2. Light fixtures weighing less than or equal to 10 lbs shall have a minimum of one #12 gage slack safety wire connected from the fixture housing to the structure above.

3. Light fixtures weighing greater than 10 lbs but less than or equal to 56 lbs may be supported directly on the ceiling runners, but they shall have a minimum of two #12 gage slack safety wires connected from the fixture housing at diagonal corners and anchored to the structure above.

4. Light fixture weighing greater than 56 lbs shall be independently supported by not less than four taut #12 gage wires attached to the housing and to the structure above. The four taut #12 gage wires, including their attachment to structure above, must be capable of supporting four times the weight of the unit.

U. Install flush mounted fixtures properly to eliminate light leakage between fixture frame and finished surface.

V. Installation of Recessed Lighting Fixtures in Accessible-type Suspended Ceilings shall be such that the fixtures will exactly suit the type of ceilings used without altering the fixture or the ceiling. Each fixture shall be wired with a piece of flexible conduit sufficiently long to remove fixture enclosure from ceiling without disconnecting unit. Fixture manufacturer shall prepare drawing or catalog sheets in which all details of fixture installation are carefully analyzed. Contractor to submit these shop drawings for approval. If clearance above "T" bar system is too restricted to "tip-in" fixture, the Electrical Contractor shall coordinate with acoustic ceiling installer by leaving one cross "T" off until the cross "T" shall be secured into its proper place.

W. Adjust aimable fixtures to provide required light intensities.

3.2 FIELD QUALITY CONTROL

A. Refer to Specification Section 269500, Electrical Acceptance Testing, for minimum required lighting testing by Contractor.

END OF SECTION 265113

SECTION 266100
LIGHTING CONTROL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections shall form a part of this Section, with the same force and effect as though repeated here.

1.2 SCOPE

A. The Contractor shall provide, install, connect, commission, test and place into operation a complete system of lighting control equipment in accordance with the requirements of 2022 California Energy Code, California Code of Regulations Title 24, Part 6, and as herein specified.

B. Basis of Design for lighting control systems: Lighting control systems are primarily based on the use of a distributed digital lighting management system for control of indoor lighting systems and astronomic time clock controls for outdoor lighting systems and sign lighting.

C. Provide lighting control equipment as indicated by drawings and schedules, including but not limited to, digital lighting management system dimming equipment, occupancy sensors, daylight sensors (photosensors), astronomic time clocks and multi-pole lighting relays and contactors and wiring.

D. Mandatory Indoor Lighting Controls:

1. Area Controls – Provide area controls in each space to facilitate the manual control of lighting within that space.

2. Multi-level controls – Provide multi-level controls to facilitate the uniform reduction of lighting energy used in each space. Multi-level controls shall be accomplished through dimming.

3. Automatic Shutoff Controls – Provide occupancy sensors in each space to automatically shut-OFF the lighting when the space is unoccupied.

4. Automatic Daylighting Controls – Provide daylight sensors in each daylit area and automatically control lighting fixtures within the daylit areas separately from the fixtures located in non-daylit areas.

5. Demand Responsive Controls – Provide controls that are capable of receiving and automatically responding to a demand response signal.

E. Mandatory Outdoor Lighting Controls:

1. Outdoor incandescent lighting – Provide a motion sensor at each outdoor incandescent luminaire that is rated over 100-watts.

2. Controls for outdoor lighting – Outdoor lighting shall be controlled by an astronomic time-switch that automatically turns OFF the outdoor lighting when daylight is available.

3. Motion Sensor Controls – Provide a motion sensor control at each outdoor lighting fixture that is located 24-feet or less above the ground; except lighting fixtures rated 40-watts or less.

F. Provide and install lighting control systems and equipment as indicated on drawings and schedules, including but not limited to, network lighting control system, network ceiling mounted occupancy sensors, network dimming manual control stations, network daylighting sensors (photosensors), network dimming control relays, network plug load control relays, network bridges, network gateways, network automated demand response control interface, network lighting control system integration for nLight enabled lighting fixtures, configuration tools, programming, configuration and documentation software, wall switches with integral occupancy sensors, emergency lighting control devices, astronomic time-switch controls and lighting control panels, photoelectric relays, and multi-pole lighting relays and contactors.

1.3 COORDINATION

A. Confirm compatibility and interface of lighting control equipment with lighting fixtures, LED drivers and ceiling systems. Report discrepancies to the Architect or Electrical Engineer, and defer ordering until clarified.

B. Coordinate with Division 21-25 to avoid conflicts between supports, fittings, and mechanical equipment.

1.4 SUBMITTALS

A. Submittals for this Section shall be made according to the Conditions of the Contract, Division 01 Specification Sections and Specification Section 260100.

B. Shop Drawings:

1. Composite wiring and/or schematic diagram of each control circuit as proposed to be installed.

2. Show exact location of all digital devices, including at minimum sensors, room controllers, and switches for each area on reflected ceiling plans.

3. Provide room/area details including products and sequence of operation for each room or area. Illustrate typical acceptable room/area connection topologies.

4. Network riser diagram including floor and building level details. Include network cable specification and end-of-line termination details, if required. Illustrate points of connection to integrated systems. Coordinate integration with mechanical and/or other trades.

C. Product Data: Catalog sheets, specifications and installation instructions.

D. Include data for each device which:

1. Indicates where sensor is proposed to be installed.

2. Prove that the sensor is suitable for the proposed application.

1.5 QUALITY ASSURANCE

A. Nothing in these Drawings or Specifications shall be interpreted as to permit any device, system, or work that is not in compliance with the 2022 California Code of Regulations. Where work is detailed and/or specified to a more restrictive standard or higher requirement, that standard or requirement shall govern such work. Applicable codes and regulations include, but are not limited to, the following:

1. All lighting control devices and systems shall be certified by the manufacturer as meeting the requirements of the current California Code of Regulations Title 20, Appliance Efficiency Regulations.

2. All work, commissioning and testing shall fully comply with the 2022 California Energy Code.

1.6 CODES AND STANDARDS

A. All work and materials shall fully comply with rules and regulations of all applicable codes cited below. Nothing in these Drawings or Specifications shall be interpreted as to permit any work not in compliance with these codes. Where work is detailed and/or specified to a more restrictive standard or higher requirement, that standard or requirement shall govern such work. Installation shall comply with the following codes and standards:

1. California Code of Regulations (CCR)
   a. Title 8, Industrial Relations
   b. Title 17, Public Health
   c. Title 24, Building Standards
2. 2022 California Building Code.
3. 2022 California Fire Code.
4. 2022 California Electrical Code.
5. 2022 California Energy Code.
6. ANSI/TIA/EIA-568-C-2012 Commercial Building Telecommunications Standard
7. ANSI/TIA/EIA-607-B-2013 Grounding and Bonding Requirements for Telecommunications in Commercial Buildings
8. BICSI TDMM Telecommunications Distribution Methods Manual 12th Edition
9. NEMA VE1 Cable Tray Systems
10. NEMA VE2 Cable Tray Installation Guides
11. UL 467 Grounding and Bonding Equipment.
12. UL 1479 Fire Tests of Through-Penetration Firestops

1.7 WARRANTY

A. The Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under 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. Provide five-year manufacturer's warranty on all digital lighting management system room control devices and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. This design is based on the use of nLight AIR wireless network lighting controls equipment manufactured by Acuity Brands nLight. Subject to compliance with project and specification requirements, equivalent products by the following manufacturers may be considered if a complete substitution request including shop drawings is submitted and approved prior to bid.

1. Network Lighting Controls nLight
2. Eaton Wavelinx;
3. WattStopper;

B. System: Network Lighting Controls nLight

2.2 NETWORK OCCUPANCY SENSOR

A. Network ceiling mounted occupancy sensors shall be dual technology digital passive infrared and microphonic occupancy sensors.

B. Network ceiling mounted occupancy sensors shall include the following features:

1. Communicates with the nLight network;
2. Low voltage auxiliary relay rated 1-amp at 24VAC/VDC with 2#20 AWG wire leads;
3. RJ45 port, RJ45 splitter and Category 5e patch cable;
4. Physical Description: Size: 4.55" diameter, 1.55" deep; Weight: 6oz; Color: Matte White;
5. Mounting: Ceiling Tile / Gypsum board surface, or 3.5" octagonal box, or single-gang handy box;

C. Network ceiling mounted occupancy sensors shall be nLight Network Lighting Controls communication compatible and powered through the nLight bus.

D. nLight product numbers: nCM PDT 9 RJB AR (in offices and spaces less than 250-square-feet); nCM PDT 10 RJB AR (in corridors and spaces greater than 250-square-feet); nCM PDT 6 RJB AR (only in spaces with ceiling height greater that 15-feet);

2.3 SINGLE-ZONE NETWORK DIMMING MANUAL CONTROL STATIONS

A. Single-zone network dimming manual control stations shall include the following features:

1. Communicates with the nLight network;

2. Two RJ45 ports;

3. Physical Description: Size: 2.74” high, 1.68” wide, 1.63” deep; Weight: 2oz; Color: Matte White;

4. Three buttons: “ON/OFF”; up arrow; and down arrow

5. Mounting: Single-gang, 2-3/4” deep switch box with single gang plaster ring, or multi-gang switch box with multi-gang plaster ring matching the number of control stations where multiple control stations are collocated.

B. Network dimming manual control stations shall be nLight Network Lighting Controls communication compatible and powered through the nLight bus.

C. nLight product number: nPODM DX; Coordinate device color with the architect and Owner prior to ordering. Device shall be compatible with wall plates having decora style openings. Provide and install a decora style wall plate matching the switch color at each switch. Provide multi-gang wall plates at multi-gang switch locations.

2.4 FOUR-SCENE NETWORK DIMMING MANUAL CONTROL STATIONS

A. Four-scene network dimming manual control stations shall include the following features:

1. Communicates with the nLight network;

2. Two RJ45 ports;

3. Physical Description: Size: 2.74” high, 1.68” wide, 1.63” deep; Weight: 2oz; Color: Matte White;

4. Eight buttons custom engraved: “ON”; “OFF”; “ENERGY”; “A/V”; “DIM-50%”; “DIM-5%”; up arrow; and down arrow

5. Mounting: Single-gang, 2-3/4” deep switch box with single gang plaster ring, or multi-gang switch box with multi-gang plaster ring matching the number of control stations where multiple control stations are collocated.

B. Network dimming manual control stations shall be nLight Network Lighting Controls communication compatible and powered through the nLight bus.

C. nLight product number: nPODM 4S DX; Coordinate device color with the architect and Owner prior to ordering. Device shall be compatible with wall plates having decora style openings. Provide and install a decora style wall plate matching the switch color at each switch. Provide multi-gang wall plates at multi-gang switch locations.

2.5 NETWORK DAYLIGHTING SENSORS

A. Network daylighting sensors shall be closed loop photosensors that measure the ambient light in the space and provide automatic dimming daylight harvesting capabilities for any load type connected to the network. Daylighting sensors shall be interchangeable without the need for rewiring.

B. Network daylighting sensors shall include the following features:

1. Communicates with the nLight network;
2. RJ45 port, RJ45 splitter and Category 5e patch cable;
3. LED indicator;
4. Physical Description: Size: 4.55” diameter, 1.55” deep; Weight: 6oz; Color: Matte White;
5. Mounting: Ceiling Tile / Gypsum board surface, or 3.5” octagonal box, or single-gang handy box;

C. Network dimming manual control stations shall be nLight Network Lighting Controls communication compatible and powered through the nLight bus.

D. nLight Product Number: nCM ADCX RJB.

2.6 NETWORK DIMMING CONTROL RELAYS

A. Network dimming control relays shall automatically bind the room loads to the connected devices in the space. The quantity of network dimming control relays shall be provided to match the number of control zones required in each space.

B. Network dimming control relays shall be the On/Off/Dimming type and include the following features:

1. Communicates with the nLight network;
2. One 120/240/277VAC, 16-amp, latching lighting relay;
3. Sinks 100mA; 0-10VDC dimmable LED drivers;
4. Two RJ45 ports;
5. LED indicator;
6. Physical Description: Size: 3.38” high x 2.53” wide x 1.83” deep + ½” chase nipple; Weight: 6oz; Color: White;
7. Mounting: Mount to a 5S x 2.5” deep large capacity outlet box;

C. Network dimming manual control stations shall be nLight Network Lighting Controls communication compatible and powered through the nLight bus.

D. nLight Product Number: nPP16 (D).

2.7 PROGRAMMING, CONFIGURATION AND DOCUMENTATION SOFTWARE

A. Programming shall be provided by the Contractor through a web-based suite of applications that gives the programmer the ability to remotely configure and monitor nLight network luminaires and nLight control devices.

B. The Contractor shall completely program and configure the lighting control system to comply with 2022 California Energy Code requirements.

C. Provide one nCOMKIT and commissioning tool interface;

D. Communication Protocol: Programming software shall communicate with nGWY2 over LAN IP network and with nLight network directly through nCOMKIT and commissioning tool interface and shall be able to program up to 20,000 network controlled devices.

E. System Requirements: Laptop or PC with Windows 7 or newer operating system; 4GB RAM and 2GB minimum available memory; Internet Explorer 10 and newer, Chrome, or Firefox browsers.

F. Acuity Controls Product Number: SensorView 13, nCOMKIT

2.8 WALL SWITCH WITH INTEGRAL OCCUPANCY SENSOR

A. Wall switches with integral occupancy sensors shall be comprised of an all digital, passive infrared technology (PIR) sensor to detect human presence.

B. System shall have field selectable auto-ON or manual-ON operating modes and shall be factory set to the manual-ON operating mode.

C. Wall switches with integral occupancy sensors shall be rated: 120/277-volt; 60Hz and shall have separate neutral and equipment grounding connection wire leads.

D. Wall switches with integral occupancy sensing shall be Sensor Switch model WSX (in Janitors closets and storage rooms having only one lighting fixture).

2.9 CONTACTORS AND AUXILIARY RELAYS

A. Contactors and relays shall comply with NEMA ICS 2.

B. Devices are electrically operated and mechanically held. Number of poles and ratings are as indicated. Coordinate rating of each unit with type of load served, including tungsten filament and inductive-type loads.

C. Modular Single-Pole Relays shall be split-coil, momentary-pulsed type, knockout mounting.

1. Low-Voltage Leads: 5-pin plug connector.

2. Pilot Contacts: Single pole.

3. Rated Capacity: 20A, 125VAC for 120-volt lighting loads, and 20A, 277VAC for 277-volt lighting loads.

4. Endurance: 50,000 cycles at rated capacity.

2.10 EMERGENCY LIGHTING CONTROL DEVICES

A. Emergency Lighting Control Unit – A UL 924 listed device that monitors a circuit providing normal lighting to an area. The unit provides normal dimming and ON/OFF control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Features include:

1. 120/277 volts, 50/60 Hz, 20 amp dimming LED driver rating

2. Push to test button

3. Auxiliary contact for remote test or fire alarm system interface

B. nLight Product Numbers: nPP16 ER SHUNT.

2.11 NLIGHT ENABLED NETWORK LIGHTING FIXTURES

A. Lighting fixtures specified as nLight enabled shall have an integral nLight network interface and be integrated into the nLight network lighting control system.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION MEETING

A. A factory authorized manufacturer's representative shall provide the electrical contractor a functional overview of the lighting control system prior to installation. The contractor shall schedule the pre-installation site visit after receipt of approved submittals to review the following:

1. Confirm the location and mounting of all digital devices, with special attention to placement of occupancy and daylighting sensors.

2. Review the specifications for low voltage control wiring and termination.

3. Discuss the functionality and configuration of all products, including sequences of operation, per design requirements.

4. Discuss requirements for integration with other trades.

3.2 INSTALLATION, CALIBRATION AND PROGRAMMING SERVICES

A. Install all devices and wiring in a professional manner. All line voltage connections shall be tagged to indicate circuit and switched legs.

B. Category 5e network cables shall not have boots installed at the RJ45 plug connectors.

C. Provide and install category 5e cable with RJ-45 connectors interconnecting all control device, bridges and gateways. If pre-terminated cable is not used for room/area wiring, the contractor is responsible for testing each field-terminated cable following installation, and shall supply the lighting controls manufacturer with test results. Low voltage wiring topology must comply with manufacturer's specifications. Contractor shall route network

wiring as shown in submittal drawings as closely as possible, and shall document final wiring location, routing and topology on as built drawings.

D. Provide and install one ¾" conduit with 2#12 copper THWN/THHN + 1#12 copper ground between nearest constant hot portion of lighting branch circuit and each PS 150 power supply. Connect line voltage to each power supply and connect the Class 2 low voltage wiring between the PS 150 power supply and network bridge.

E. Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated. Before start up, the contractor shall test all devices to ensure proper communication.

F. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings.

G. Adjust time delay so that controlled area remains lighted while occupied.

H. Provide written or computer-generated documentation on the configuration of the system including room by room description including:

1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.

2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)

3. Load Parameters (e.g. blink warning, etc.)

I. Post start-up tuning – After 30 days from occupancy contractor shall adjust sensor time delays and sensitivities to meet the Owner's requirements. Provide a detailed report to the Architect / Owner of post start-up activity.

J. Network daylight sensors for automatic dimming within a daylit zone shall be calibrated such that lighting power for the lighting fixtures within that daylit zone shall be reduced by 65% when daylit illuminance is 150% of design illuminance. Design illuminance for specific spaces shall be as recommended by the IESNA Lighting Handbook 8th Edition Chapter 11, Figure 11-1, for Commercial, Institutional, Residential, and Public Assembly Interiors.

K. Program uniform manual dimming and ON-OFF control within each space that has a network daylight sensor:

1. Lighting fixtures located within daylit zones shall be programmed to manually turn ON and OFF with lighting fixtures located outside of the daylit zones (in the same space) with a common ON/OFF button.

2. Lighting fixtures located within daylit zones shall be programmed to manually dim at the same rate as lighting fixtures outside of the daylit zone (in the same space) once lighting fixtures outside of the daylit zone have had lighting power manually reduced by 65%.

L. Program four-scene network dimming manual control stations as follows:

1. ENERGY SAVER (Scene 1): Selection of the "ENERGY SAVER" scene shall uniformly lower the lighting levels of all lighting fixtures within the space to 85-percent of their maximum lighting power demand (emulates demand response at local zone level).

2. A/V (Scene 2): Selection of the “A/V” scene shall turn OFF lighting fixtures in zones with lighting fixtures located in front of a projection screens or video monitors and shall reduce all other zones within the space to 20-percent of maximum light output.

3. DIM-50% (Scene 3): Selection of the “DIM-50%” scene shall uniformly lower the lighting levels of all lighting fixtures within the space to 50-percent of maximum light output.

4. DIM-5% (Scene 4): Selection of the “DIM-5%” scene shall uniformly lower the lighting levels of all lighting fixtures within the space to 5-percent of maximum light output.

5. Dimming manual control station shall include ON/OFF control.

3.3 FACTORY SERVICES

A. Upon completion of the installation, a manufacturer's factory authorized representative shall start up and verify a complete and fully functional system.

B. Upon completion of the system start up, the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

3.4 ACCEPTANCE TESTING AND COMMISSIONING

A. The Contractor shall provide the services of a California State certified lighting controls acceptance test technician (CLCATT) to act as the acceptance testing agent and verify the installation of the lighting control systems.

B. Provide the services of a manufacturer’s factory technician time to assist the CLCATT review the functionality and settings of the lighting control hardware per the requirements in the California State forms.

C. The Contractor shall provide the services of a Commissioning Agent to provide commissioning of the indoor and outdoor lighting systems. The following commission tasks shall be completed in accordance with 2022 California Energy Code, Section 120.8 Building Commissioning:

1. The Commissioning Agent shall obtain the Owner’s Project Requirements.

2. The Commissioning Agent shall compile and update a Basis of Design during the construction of the project.

3. The Commissioning Agent shall complete a commissioning plan including the following information:

   a. General project information

   b. Commissioning goals

   c. Systems to be commissioned

   d. Plans to test systems and components, which shall include:

      1) An explanation of the original design intent

2) Equipment and systems to be tested, including the extent of the tests

3) Functions to be tested

4) Conditions under which the test shall be performed

5) Measurable criteria for acceptable performance

6) Commissioning team information

7) Commission process activities, schedules and responsibilities

4. The Commissioning Agent shall provide function performance testing.

5. The Commissioning Agent shall provide system documentation and training requirements.

6. The Commissioning Agent shall provide a commissioning report.

3.5 TITLE 24 - PART 6 DOCUMENTATION OF INSTALLATION AND ACCEPTANCE FOR INDOOR AND OUTDOOR LIGHTING

A. The Contractor shall prepare and submit the following Certificates of Installation:

1. Indoor Lighting:

a. Certificate of Installation – Validation of Certificate of Compliance (NRCI-LTI-01-E)

b. Certificate of Installation – Energy Management Control System or Lighting Control System (NRCI-LTI-02-E)

2. Outdoor Lighting:

a. Certificate of Installation – Outdoor Lighting (NRCI-LTO-01-E)

b. Certificate of Installation – EMCS – Lighting Control System (NRCI-LTO-02-E)

B. The Contractor shall provide the services of a California state certified lighting controls acceptance test technician (CLCATT) to perform acceptance tests, prepare Certificates of Acceptance and certify that all indoor and outdoor lighting systems comply with the 2022 California Energy Code Section 130.4. The Certificates of Acceptance shall bear the name and certification identification number of the certified lighting compliance acceptance test technician. The certified lighting compliance acceptance test technician shall prepare and submit the following Certificates of Acceptance:

1. Indoor Lighting:

a. Certificate of Acceptance – Lighting Controls (NRCA-LTI-02-A)

b. Certificate of Acceptance – Automatic Daylighting (NRCA-LTI-03-A)

2. Outdoor Lighting:

a. Certificate of Acceptance – Outdoor Motion Sensor and Lighting Shut-off Controls (NRCA-LTO-02-A)

C. The Contractor shall properly calibrate all lighting control devices and systems. To verify that the lighting control devices and systems have been properly calibrated the Contractor shall conduct the following tests as outlined in Chapter 13 of the 2022

California Energy Commission Nonresidential Compliance Manual, Article 13.87 Test Procedures for Indoor & Outdoor Lighting, and make modifications to the control until it passes the test:

1. Indoor Lighting:
    a. 13.88 NA7.6.1 Automatic Daylighting Control Acceptance
    b. 13.89 NA7.6.2.4 and NA7.6.2.5 Automatic Time Switch Acceptance
    c. 13.90 NA7.6.2.2 and 7.6.2.3 Occupant Sensor Acceptance
2. Outdoor Lighting
    a. 13.92 (NA7.8) Outdoor Lighting Shut-off Controls

3.6 ON-SITE ASSISTANCE

A. Within one year of date of Substantial Completion, provide up to three Project site visits, when requested, to adjust light levels, make program changes, and adjust sensors and controls to suit actual conditions.

3.7 PERSONNEL TRAINING

A. Train Owner’s building personnel in procedures for starting-up, testing and operating lighting control system equipment.

END OF SECTION 266100

SECTION 269500
ELECTRICAL ACCEPTANCE TESTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section defines the Electrical Acceptance Tests and checks that shall be made on all electrical equipment and wiring to ensure compliance with all applicable Codes and Standards, and with the requirements of the Contract Documents.

B. All electrical equipment testing and related costs shall be included in the Contractor's bid.

1.2 GENERAL REQUIREMENTS

A. The Contractor shall test equipment of all kinds installed on this project to determine whether it fulfills the requirements of these Specifications. The Contractor shall furnish all labor necessary to adjust the operation of the apparatus and make the connections for the tests. After the tests have been completed, the Contractor shall restore all connections, apparatus, etc., to their original condition.

B. The Contractor shall retain the services of a qualified Independent Testing Agency holding a valid current C-10 License to perform **certain** tests and prepare reports, as enumerated in the following Articles. The Independent Testing Agency shall be a company that specializes in electrical equipment testing and shall be NETA or NICET certified.

C. Contractor shall obtain approval from the architect of proposed independent testing agency(s) before any testing is started.

D. Electrical systems, equipment and materials shall be tested prior to final acceptance of the work.

1.3 INDEPENDENT TESTING AGENCY REQUIREMENTS

A. The Independent Testing Agency shall furnish personnel acceptable to Engineer to conduct testing. Supervising engineer shall have a minimum of five years experience in testing of equipment of the type to be tested on this Project.

B. The Independent Testing Agency shall furnish all labor required for and incidental to testing.

C. The Independent Testing Agency shall provide minor field repairs, adjustments, and wiring modifications at the time of inspection and testing.

D. The Independent Testing Agency shall furnish all necessary test equipment to satisfactorily perform all tests specified herein.

E. The Independent Testing Agency shall check all devices for proper operation - checking for wear, tightness, dirt, etc.

F. The Independent Testing Agency shall check for conformance to published curves.

G. The Independent Testing Agency shall notify and coordinate with the Owner's representative at least 3 working days prior to the commencement of any Electrical Acceptance Testing. Tests shall be witnessed by the Owner's representative unless such witnessing is waived in writing by the Owner's Representative.

1.4 CODES AND STANDARDS

A. 2022 California Electrical Code (CEC).

B. National Electrical Manufacturer's Association (NEMA).

C. Manufacturer's Instructions and Maintenance Manual applicable to each particular apparatus.

D. OSHA Rules and Regulation.

E. National Electrical Testing Association (NETA) "Acceptance Testing Specifications".

F. Procedures as directed by Engineer.

1.5 CARE AND PRECAUTIONS

A. Contractor shall be responsible for any damage to equipment or material due to improper test procedures or test apparatus handling, and shall replace or restore to original condition, any damaged equipment or material.

B. Contractor shall furnish and use safety devices such as rubber gloves and blankets, protective screens, barriers, and danger signs to adequately protect and warn all personnel in the vicinity of the tests.

1.6 EQUIPMENT TO BE TESTED BY CONTRACTOR

A. Perform the visual inspections, manual operations and tests on systems and equipment as described in Part 3, "Execution".

B. Molded Case Circuit Breakers Rated Less Than 100A

C. Power Cable

D. Disconnect Switches

E. Motors

F. Lighting

G. Title 24 Acceptance Testing

H. Fire Alarm System

I. Intercommunications, Clock, and Program System

J. Communication System

1.7 EQUIPMENT TO BE TESTED BY INDEPENDENT TESTING AGENCY

A. Circuit Breakers Rated 100A and Greater

B. Grounding System

C. Switchboards and Panels

1.8 SUBMITTALS

A. Submittals for this Section shall be made according to the Conditions of the Contract, Division 01 Specification Sections and Specification Section 260100.

B. Test Reports

1. Provide written test reports, signed and dated, for all tests prior to acceptance of the tested equipment by the Owner.

2. Submit certified reports of Independent Tests and Observations indicating and interpreting test results specified in Part 3 of this Section.

a. The Test Report shall include the following:

1) Description of equipment tested.

2) Description of test procedure.

3) Calibration record for all testing devices used.

4) Test results.

5) Recommendations.

6) Appendix, including all field test reports.

b. Furnish six copies of completed report to the Electrical Engineer no later than ten days after test completion unless requested otherwise by Owner.

c. Instrumentation-Traceability: The testing agency shall provide calibration labels for all relays and circuit breakers tested.

d. Labels shall be self-adhesive and placed on covers or frames so as not to obscure nameplate, tap block or time dial. Label shall indicate date tested and firm name.

PART 2 - PRODUCTS

2.1 TESTING EQUIPMENT

A. Furnish suitable electrical instruments including voltmeters, ammeters, wattmeters, tachometers and all other equipment necessary to perform tests specified.

B. Make necessary openings in circuits for testing instruments and place and connect all instruments, equipment and devices necessary for the tests. Upon completion of tests, remove instruments and instrument connections and restore all circuits to permanent condition.

2.2 TESTING COORDINATION

A. Coordinate activities and cooperate with others on the Project to ensure that systems are energized when required, when loads are applied, and that other requirements of this Section of the Specifications are carried out in a timely, coordinated basis.

B. Conduct tests in the presence of the Construction Manager. Notify the Construction Manager seven calendar days or more in advance when any test is to be performed, and do not start tests without the permission of the Construction Manager.

C. Make up no permanent connections until correct phase sequence of all equipment is determined.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall provide Acceptance Testing on the entire Electrical System. Certain of this testing shall be performed by an Independent Testing Agency as indicated.

B. Acceptance Testing shall include Visual Inspections, Manual Operations, Electrical Tests, and Functional Testing.

C. Whenever possible, all Visual Inspections, Manual Operations and Electrical Tests shall be made just prior to energizing the equipment or circuits, and shall be coordinated with the field schedule and field conditions.

D. Test reports on megger, dielectric absorption and high potential tests shall include the ambient temperature and relative humidity existing at the time of the tests.

E. Should any piece of apparatus or any material or work fail during any of these Tests, it shall be immediately removed and be replaced by perfect material by this Contractor at his expense and the portion of the work replaced be again tested by the Contractor.

F. Before testing and energizing a system, all necessary precautions shall be taken to ensure the safety of personnel and equipment. All conductors and all electrical equipment shall be properly insulated and enclosed. All enclosures for conductors and equipment shall be properly grounded. Insulation resistance measurements must have been made and approved on all conductors and energized parts of electrical equipment.

1. During actual testing, the Contractor or Independent Testing Agency shall:

a. Ensure that temporary power terminations are connected in such a manner that commercial power may be restored in forty-five minutes upon request.

b. Place temporary power cables out of the way in a safe manner that provides no hazard to personnel or equipment in the area.

c. Provide all special connections required.

d. Conduct all tests in presence of the representative except where advised this would not be necessary.

G. The entire installation shall be free from short circuits and improper grounds. Panels and circuits shall be tested for grounds and shorts with mains disconnected from the feeder, branches connected, lamps removed or omitted from the sockets and all wall switches closed. Each individual circuit shall be tested at the panel with the equipment connected for proper operation

H. The following minimum tests are required, but shall not be limited to this list. Tests will be supervised and witnessed by the Construction Manager:

1. Proper phase rotation.

2. Short circuits.

3. Improper grounds.

4. Power and control electrical circuits for circuit continuity and function test.

I. Furnish all personnel, labor, meters, instruments, cable, connections, equipment and apparatus necessary for making all tests.

J. Check and test all switchboards, transformers, panelboards, feeders, power and control cables, communication system devices and wiring, and all connections to all equipment.

K. After wires and cables are in place and connected to devices and equipment, the system shall be tested for short circuits, improper grounds, and other faults. If fault condition is present, the trouble shall be rectified and the wiring system shall be retested.

L. A voltage test shall be made at each lighting panel, distribution panel and at the last outlet on each circuit. If drop in potential exceeds one percent, correct the condition by locating the ground or high resistance splice or connection and retest.

M. Any wiring device, electrical apparatus, or lighting fixture grounded or shorted on any integral "live" part, shall be removed and the trouble rectified by replacing the defective parts or materials.

N. All final tests shall be witnessed by the Construction Manager and three copies of the verified test results shall be given to the Architect/Engineer and Construction Manager promptly upon completion of a test.

O. Provide assistance to the various equipment manufacturers' field engineers as required in the testing and adjusting of the electrical power and control equipment. Cooperation shall be such that a minimum of time is required for equipment testing.

P. A log shall be maintained for all tests. This log shall be certified before completion of the project, both as to test value and date of test. All major equipment such as the switchboard and panelboards shall be energized initially in the presence of the Construction Manager.

Q. The Owner reserves the right to operate any system or equipment prior to final completion and acceptance of the work. Such preliminary operation shall not be construed as an acceptance of any work. Each piece of equipment and all of the

systems shall be adjusted to insure proper functioning and shall be left in first class operating condition.

3.2 VISUAL INSPECTIONS

A. Prior to Manual Operation and Electrical Testing, perform Visual Inspections to verify the following:

1. The equipment is completely and properly installed.
2. The equipment is free from damage and defects.
3. Shipping blocks and restraints have been removed.
4. Electrical terminations have been properly tightened.
5. The equipment has been properly aligned.
6. The equipment has been properly lubricated.
7. The ventilation louvers are open and unobstructed.
8. Voltages and phases have been properly identified.
9. Terminations in control panels have been properly identified.
10. The equipment is ready to be tested

3.3 MANUAL OPERATION

A. Prior to any Electrical Testing, mechanical devices shall be exercised or rotated manually to verify that they operate properly and freely.

3.4 ELECTRICAL TESTS BY CONTRACTOR

A. Molded Case Circuit Breakers rated less than 100A

1. Circuit breakers will be operated manually several times to ensure smooth operation.
2. Molded case will be inspected for cracks.
3. Rated current will be passed through each phase and millivolt readings taken across contacts.
4. Time current characteristic tests will be performed by passing 300% rated current through each phase and monitoring trip time.
5. Instantaneous pickup current will be determined by finding the current level at which the breaker trips out in less than 2 cycles.
6. Insulation resistance tests will be performed at 1000 Volts DC.
7. Circuit breaker covers will be removed on unsealed units and checked for cracks. Interphase barriers and arc chutes to be inspected. All bolts and lugs will be tightened. All internal auxiliary devices will be inspected.

8. Contacts, shunts, etc., will be visually inspected for wear and alignment.

9. Inverse trip time, instantaneous pickup current and millivolt drop across contacts, insulation resistance values, as well as deficiencies causing breaker to function outside published limits will be recorded. Times will then be compared with manufacturer's or NEMA published values.

B. Power Cable

1. The 600-volt insulated wires and cables shall be factory tested prior to shipment in accordance with ICEA Standards for the insulation specified.

2. Perform a continuity check and a 1,000 volt DC megger test on 600 volt power cables No. 6 AWG and larger.

   a. The megger test shall be performed between each pair of conductors and from each conductor to ground.

   b. The megger test shall be performed for 15 seconds or until the insulation resistance value stabilizes.

   c. The insulation resistance between conductors and from each conductor to ground shall be 100 megohms minimum in one minute or less. In addition, the lowest insulation resistance value shall not differ from the highest value by more than 20 percent.

3. Phase conductors, if shorted, grounded or at fault shall be removed, shall be replaced and the wiring system shall be retested.

C. Disconnect Switches

1. Check for cleanliness of contacts, operation, etc.

2. Lubricate contacts and mechanical devices.

3. Check fuse-clip tightness.

4. Perform a 1,000-volt megger test on disconnect switches rated for 600V and at 500 volts for disconnect switches rated for 240V.

D. Motors

1. Perform a 1,000-volt megger test on 460 volt, 3 phase motors, and a 500 volt megger test on 200-230 volt, 3 phase motors.

2. "Bump" motors to verify proper direction of rotation.

3. Run motors and check for vibration and overheating.

E. Lighting

1. Upon completion of installation of lighting fixtures and controls, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. The Contractor shall replace at his expense all noisy ballasts, broken or cracked lenses or other defective items. Where possible, correct malfunctioning units at site, then re-test to demonstrate compliance; otherwise, remove and replace with new units, and proceed with re-testing.

2. At the time of substantial completion, replace lamps in interior lighting fixtures, which are observed to be noticeably dimmed after Contractor's use and testing, as judged by Architect or Electrical Engineer.

3. Give advance notice of dates and times for field tests.

4. Provide instruments to make and record test results.

5. Tests and Observations

   a. Verify normal operation of lighting units after installing fixtures and energizing circuits with normal power source.

   b. Check for excessively noisy ballasts.

   c. Interrupt electrical energy to demonstrate proper operation of emergency lighting installation. Include the following information in tests of emergency lighting equipment:

      1) Duration of supply

      2) Low battery voltage shutdown.

      3) Normal transfer to battery source and retransfer to normal.

      4) Low supply voltage transfer.

      5) Report results of tests in wiring.

F. Title 24 Acceptance Testing

1. Perform tests as outlined in Part 3 of Specification Section 265113.

G. Fire Alarm System

1. Perform testing in accordance with NFPA 72-2022.

H. Intercommunications, Clock, and Program System

1. Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components, perform the initial system programming, and oversee the pre-testing, testing and adjustment of the system.

2. Programming: Fully brief the Owner on programming options available for the system. Record his programming decisions and set up the initial programming of the system. Set system so signal devices operate on required schedules and are activated for durations selected by the Owner. Program relay output circuits to suit Owner's operating schedule for the equipment controlled. Provide the Owner with a written record of the decisions, implementation methodology, and final results.

3. Test Procedure: Conform to the following:

   a. Schedule tests a minimum of 7 days in advance of performance of tests.

   b. Report: Submit a written record of inspection and test results.

   c. Operational Test: Perform operational system test to verify conformance of system to these Specifications. Perform tests that include originating station-to-station, all-call, and page messages at each intercommunication station. Verify proper routing and volume levels and freedom from noise and distortion. Test each available message path

from each station on the system. Include operation of all modes of clock correction and all programming and manually programmed signal and relay operating functions.

d. Frequency Response Test: Determine frequency response of 2 transmission paths, including all-call and paging by transmitting and recording audio tones. The minimum acceptable performance is within 3 dB from 150 to 2500 Hz.

e. Signal-to-Noise Ratio Test: Measure the ratio of signal to noise of the complete system at normal gain settings, using the following procedure:

1) Disconnect a speaker microphone and replace it in the circuit with a signal generator using a 1000-Hz signal. Measure the ratio of signal to noise.

2) Repeat the test for 4 speaker microphones and for each separately controlled zone of paging loudspeakers.

3) The minimum acceptable ratio is 35 dB.

f. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 150, 200, 400, 1000, and 2500 Hz into each paging and all-call amplifier, and a minimum of 2 selected intercommunication amplifiers, and for each frequency, measure the distortion in the paging and all-call amplifier outputs. The maximum acceptable distortion at any frequency is 5 percent total harmonics.

g. Acoustic Coverage Test: Feed pink noise into the system using octaves centered at 500 and 4000 Hz. Use a sound-level meter with octave band filters to measure the level at 3 locations in each paging zone. The maximum permissible variation in level is plus or minus 3 dB, and the levels between adjacent zones must not vary more than plus or minus 5 dB.

h. Power Output Test: Measure the electrical power output of each paging amplifier at normal gain setting at 150, 1000, and 2500 Hz. The maximum variation in power output at these frequencies must not exceed plus or minus 3 dB.

i. Signal Ground Test: Measure and report ground resistance at the system signal ground. Conform to the testing requirements of Division 26 Section "Grounding."

4. Retesting: Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards. Provide a written record of all retest results.

5. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Provide a list of final tap settings of paging speaker line matching transformers.

I. Communication System

1. Refer to Division 27 Sections of these Specifications for testing.

3.5 INDEPENDENT AGENCY TESTING

A. Circuit Breakers rated 100A or greater

1. All circuit breakers, 100 amps or more, shall be tested by an independent testing agency in accordance with NETA specifications and a report submitted to the architect. Any circuit breaker that does not pass the test shall be replaced.

2. Circuit breakers will be operated manually several times to ensure smooth operation.

3. Molded case will be inspected for cracks.

4. Rated current will be passed through each phase and millivolt readings taken across contacts.

5. Time current characteristic tests will be performed by passing 300% rated current through each phase and monitoring trip time.

6. Instantaneous pickup current will be determined by finding the current level at which the breaker trips out in less than 2 cycles.

7. Insulation resistance tests will be performed at 1000 Volts DC.

8. Circuit breaker covers will be removed on unsealed units and checked for cracks. Interphase barriers and arc chutes to be inspected. All bolts and lugs will be tightened. All internal auxiliary devices will be inspected.

9. Contacts, shunts, etc., will be visually inspected for wear and alignment.

10. Inverse trip time, instantaneous pickup current and millivolt drop across contacts, insulation resistance values, as well as deficiencies causing breaker to function outside published limits will be recorded. Times will then be compared with manufacturer's or NEMA published values.

11. The testing agency shall provide calibration labels for all relays and circuit breakers tested. Labels shall be self-adhesive and placed on covers or frames so as not to obscure nameplate, tap block or time dial. Label shall indicate date tested and firm name.

B. Grounding System

1. Test shall be performed for every new separately derived AC system.

2. Ground tests shall meet the requirements of the California Electrical Code and comply with UL 467. The grounding electrode system at the main electrical service equipment shall be tested by an Independent Testing Agency in accordance with the three point fall of potential method as specified in IEEE Standard 81-1983. Maximum ground resistance shall be 5 OHMS. A copy of the test report shall be submitted to the architect and engineer of record.

3. Maximum grounding to resistance values are as follows:

a. Equipment Rated 500 kVA and Less: 5 ohms.

b. Equipment Rated 500 to 1000 kVA: 5 ohms.

c. Equipment Rated More than 1000 kVA: 3 ohms.

4. Tests: Subject the completed grounding system to a megger test at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than 2 full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2-point method according to IEEE 81.

5. The test agency shall remove the test link between the ground and neutral, and test the neutral for any parallel and/or superfluous ground paths. If any are found, a report should be given to the Engineer. No grounds are to be removed unless authorized in writing.

6. Ground electrode resistance shall be taken using a Biddle ground resistance meter and readings given to the report.

7. All ground connections in switchboard as well as that to cold water pipes shall be check for tightness and adequacy.

8. Measure the resistance to ground of each ground rod [in a ground mat] before connection to the other ground rods. The resistance shall not exceed 10 ohms.

9. Measure the resistance to ground of the total ground system with all connections completed. The resistance shall not exceed 2 ohms for primary services or 5 ohms for secondary services.

10. Tests of the resistance to ground shall be made using either the three point method or the fall-of-potential method.

11. Perform a continuity check from equipment ground bus bars and ground lugs to the ground system.

12. Ground rods for manholes and light poles need not be tested.

13. Excessive Ground Resistance: Where resistance to ground exceeds specified values, notify Owner promptly and include recommendations to reduce ground resistance and to accomplish recommended work.

14. Report: Prepare test reports, certified by the testing organization, of ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Switchboards and Panels

1. The Independent Testing Agency shall perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification, Sections 7.1, 7.6, 7.9, 7.10, 7.11, and 7.14, as appropriate. Certify compliance with test parameters.

2. After Substantial Completion, but not more than 2 months after Final Acceptance, The Independent Testing Agency shall perform an infrared scan of each switchboard and panel.

    a. Remove fronts to make joints and connections accessible to a portable scanner.

b. Use an approved infrared-scanning device designed to measure temperature or detect significant deviations from normal values.

c. Provide calibration record for device used.

d. Prepare a certified report identifying switchboards and panels checked and describing results of infrared scanning. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

3.6 FUNCTIONAL TESTING

A. All automatic and manual functions shall be checked for proper operation.

B. All indicating circuits, lights and alarms shall be tested for correct operation. Burned out indicators shall be re-lamped.

C. Upon completion of the Work, place the entire installation in operation, test for proper function, and show systems and equipment to be free of defects.

END OF SECTION 269500

SECTION 272000
COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install horizontal cable links between outlets and the corresponding building IDF/MDF, patch panels, outlet boxes, conduits and raceways, jack modules for terminating both ends of each cable, and cover plates.

B. The Contractor shall provide termination, testing and certification of each cable.

C. The furnishing of network servers and switches is specifically excluded from this section.

PART 2 - PRODUCTS

2.1 TELECOMMUNICATIONS BACKBOARD

A. Telecommunications Backboard Panels: Plywood, DOC PS 1, Exterior, A-C (A face mounted facing out), 3/4-inch nominal thickness.

1. Finish: Intumescent paint finish; Flame Stop Inc.; Flame Stop IM.

a. Flame Spread: Zero (0) per ASTM E 84; 30 Minute Test Method of Test of Surface Burning Characteristics of Building Materials.

b. VOC Content: Not more than 50 g/L.

c. Applied Thickness: Two coats, each coat applied at a rate of 200 sf/gal.

d. Color and Gloss: As selected by Architect from manufacturer's full range.

e. Substrate Primers: Primers approved by intumescent paint manufacturer, where manufacturer recommends use of a primer.

2. Where installed in wire closet, height and width must cover entire wall up to 8 feet above floor, except as otherwise indicated.

2.2 TELECOMMUNICATION CABINETS AND RACKS

A. Intermediate Distribution Frame (IDF)

1. Materials –36”H Double Swing Sub-d Box 19” wide rack mount with Plexiglass front door.

2. Dimensions – 24”W x 24”D x 36”H

3. Manufacturer – Chatsworth

4. Model – 11900-736

2.3 TELECOMMUNICATION BACKBONE CABLE

A. OSP Rated Optical Fiber Cable (Data Backbone)

1. Description: Indoor/Outdoor rated, fully water blocked for use in outdoor applications. Aluminum interlocked armor jacketed 6-strand single mode (50um) optical fiber cable. Note: All loose tube cables must be provided with the appropriate fan-out kits to transition from loose tube construction to tight buffered fiber for termination.

2. Manufacturer: Superior Essex

3. Model: F108-006U13-E991

2.4 TELECOMMUNICATION BACKBONE CABLE TERMINATIONS

A. Fiber Housing – 1U

1. Materials – 19” Rack-mountable patch panels, 1U high, with built-in cable management, and removable doors.

2. Manufacturer – Panduit

3. Model – 1RU – FCE1U

B. SC Adapter Panel

1. Materials – SC-type, OS1/OS2 FAP loaded with six singlemode fiber optic adapter. Blue.

2. Manufacturer – Panduit

3. Model – FAP6WBUDSCZ

C. Blank Fiber Panel

1. Materials – Blank panel for unused openings in fiber housing.

2. Manufacturer – Panduit

3. Model – FAPB

D. SC Connector

1. Materials – SC-type, with ceramic ferrule. OS2 singlemode duplex fiber optic connector. Blue.

2. Manufacturer – Panduit

3. Model – FSCSCBU

2.5 COMMUNICATION HORIZONTAL CABLING

A. Horizontal Data Cable – For Connection of Equipment to the Local Area Network:

1. Materials – 23 AWG solid copper UTP, 4-pair, Category 6 cable.

2. Manufacturer – General Cable (GenSPEED 6)

B. Horizontal Data Cable – For Outdoor Rated Connection of Equipment to the Local Area Network Between Portable Classroom Buildings:

1. Materials – 23 AWG solid copper UTP, 4-pair, Category 6 cable.

2. Manufacturer – General Cable (GenSPEED OSP)

2.6 COMMUNICATION HORIZONTAL CABLE TERMINATIONS

A. Horizontal Data Cable Patch Panels

1. Materials – 48-port, 2U Category 6 patch panel, with NetKey Jack modules. Rack-mountable (19”). Color: Black.

2. Manufacturer – Panduit (P/N NKPP48FMY)

B. Data Outlets

1. Station Jack Modules – Materials – 8-position RJ45, Category 6 rated jack modules. Manufacturer – Panduit (P/N NK6TMxx).

2. 106 Frame Faceplate - 4-port, single-gang faceplate. Blanks shall be installed in each unused port. Panduit (P/N NK4RMFxx).

3. Surface Mount Box – Materials – 2-port, plenum rated, surface mount box. – Panduit (P/N CBX2EI-AY)

2.7 J HOOKS

A. Description: J hook cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables; cULus Listed. J hook cable supports shall have flared edges to prevent damage while installing cables. J hook cable supports shall be 1 5/16” minimum and have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable and be suitable for use in air handling spaces. J hook cable supports shall have an electro-galvanized or G60 finish and shall be rated for indoor use in non-corrosive environments.

B. Manufacturer: Erico

C. Model: Caddy Cablecat Series

2.8 LABELS

A. Materials: Vinyl plastic type that meet UL 969 requirements, preprinted or laser printed type, and easily distinguishable.

B. Manufacturers – Panduit, W.H. Brady, Ideal.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. The Contractor shall utilize conduits and cable trays for the placement of horizontal voice and data cables. Cables which exit cable trays shall be supported by J-hooks that are attached to the structure independently from ceiling or lighting fixture supports.

B. Where penetrations through fire rated walls, acoustical or other walls are made for cable pass-thru, such penetrations shall be sealed by the Contractor in compliance with code requirements.

3.2 BONDING AND GROUNDING

A. The Contractor shall provide ground continuity by properly bonding all appropriate cabling, closures, cabinets, service boxes, conduit, cable trays, and framework. All grounds shall consist of #6 AWG stranded copper wire and shall be attached to an approved building ground, which is bonded to the main electrical ground. Grounding shall be in accordance with J-STD-607-A, CEC, NFPA and all local codes and practices.

3.3 IDENTIFICATION & LABELING

A. The Contractor shall obtain the room numbers that will appear on door signage prior to assigning origin and destination identification for labels.

1. Horizontal cables shall be labeled at each endpoint. Labels shall indicate origination and destination identification.

2. All label printing will be machine generated by system software using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end

3.4 ACCEPTANCE TESTING AND CERTIFICATION

A. All distribution cables shall meet or exceed all performance specifications designated by ANSI/EIA/TIA-568-B.1, and IEEE for telephone and data communications.

B. Copper Cables: Testing of all copper wiring shall be performed prior to system cut-over. 100 percent of the OSP and horizontal wiring pairs shall be tested for opens, shorts, polarity reversals, transposition and presence of AC voltage. Test shall include length, mutual capacitance, characteristic impedance, attenuation, and near-end and far end cross-talk. The Contractor, at no charge shall bring any pairs not meeting the requirements of the standard into compliance with the standards and specifications. Complete, end to end test results must be submitted to the Owner. Test results for each of the above tests and associated cable lengths shall be generated by an automated testing device. Test results must be permanently recorded and presented for review in both hardcopy and in a computer-readable format.

3.5 PROJECT RECORD DOCUMENTATION

A. The Contractor shall provide a database of cable records, both hard copy and on floppy disk, using Owner approved format (Excel spreadsheet or otherwise specified) for use by the Owner for cable and facilities management. The cable records format must include, at a minimum, the following information about each cable:

1. Distribution Cable Pair Assignments.

2. Test Results.

B. Three (3) sets of reproducible as-built floor plans plus vertical rack elevations and wall mounted termination field details in digital format (AutoCAD) showing all installed cables, pair and strand assignments, routing, terminal and outlet locations, patch panels and labeling conventions.

C. These documents shall be delivered to the Owner no more than 20 working days after completion and acceptance of the Contractor’s work.

END OF SECTION 272000

SECTION 27 41 00
AUDIO-VIDEO SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. To support the educational process, technology will be installed within each of the classrooms to meet the districts standards.

1. Inputs: Users will be presented with an HDMI input at a convenient location at the teaching station. A Bluetooth audio receiver will be located at the same location.

2. Outputs: A ceiling or wall mount projector and whiteboard will be installed within the space. Speakers will be installed at the front of the room or within the ceiling. An Assistive Listening System output will be provided at the teaching station for use with a with portable system.

1.2 SECTION INCLUDES:

A. Provisioning of all labor, materials, equipment, accessories, services, and tests necessary to complete and make ready for operation, by the owner, the audiovisual system requirements for the space in accordance with this specification and the “E” series drawings.

B. Equipment to be provided includes

1. Audio Cabling

2. Accessories (as called for)

C. Equipment to be provided by owner and installed by contractor

1. Projectors & Mounts

2. Self Powered Speakers

3. HDMI Extenders

4. Bluetooth Receivers

5. Pre-terminated AV cables

D. Notwithstanding the detailed information in this specification, it is the responsibility of the contractor for verifying the completeness of the parts list, the correctness of the type numbers, and to supply a fully working system meeting these specifications.

1.3 QUALITY ASSURANCE

A. All equipment rooms shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owners representative. Equipment and materials shall be of the quality and manufacturer indicated. The equipment specified is based on the acceptable manufacturers listed. Where "approved equal” is stated, equipment shall be equivalent in every way to that of the equipment specified, and subject to approval.

B. Materials and work specified herein shall comply with the applicable requirements of:

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for the intended use.

2. Comply with CEC.

3. Comply with UL 50.

1.4 SUBSTITUTIONS

A. Substitutions: Substitutions will only be allowed by substitution requests submitted in accordance with Division 01 Section “Substitution Procedures” before the bid date.

1.5 SUBMITTALS

A. Qualifications: To be considered technically qualified for this project, the contractor shall submit proof of the following:

1. A minimum of 5 years with professional video system integration.

B. Pre-installation:

1. Equipment List: Submissions shall include a list of major equipment and a specification sheet for each major component that differs from those specified, showing it’s the satisfaction of specified requirements.

a. The list of major equipment shall include; Manufacturer, Model, Quantity.

b. Alternative equipment and methods will be reviewed; however, it is the responsibility of the contractor to demonstrate the alternate meets or exceeds the performance specified. Product details for any voluntary alternates or product substitutions.

2. Shop Drawings: Comprehensive wiring diagram showing all devices, cable types, connectors, and labels.

C. Post-installation:

1. As-Built Drawings: The contractor shall provide the Owner with as-built drawings reflecting the layout and labeled wiring diagrams of the completed system. Drawings to be submitted in PDF format.

2. Warranty Statement: Provide the terms and conditions of the one-year warranty covering all parts and labor starting upon system acceptance.

1.6 COORDINATION

A. Coordinate layout and installation of system components with other construction trades.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. General: Major equipment is specified in this section. Note the following:

1. Equipment shall have an equal or better performance to units described as “Design Make”.
2. Minor material not specified below shall be of professional quality.
3. All cabling run through ceiling shall include a plenum rated jacket.
4. All speaker cabling shall be a minimum of 16AWG.

B. Coordinate features to form an integrated system. Match components and interconnections for optimum performance of specified functions.

C. Equipment: Modular type using solid-state components, fully rated for continuous duty, unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.

2.2 ULTRASHORT THROW PROJECTOR (OWNER FURNISHED)

A. Description: WXGA 3LCD Projector. 3500 lumens. 14,000:1 dynamic contrast ratio. 1280 x 800 native resolution. VGA, Two HDMI, Ethernet, IR remote is included.

B. Design Make: Epson – 685W

2.3 ULTRASHORT THROW PROJECTOR MOUNT (OWNER FURNISHED)

A. Description: Dual-stud projector mount for Epson PowerLite/BrightLink 47x, 48x, 5xx, 6xx projectors.

B. Design Make: Epson – ELPMB46

2.4 WALL MOUNTED SPEAKER (OWNER FURNISHED)

A. Description: 6.5" 2-way speaker. Built-in amplifier. Includes wall mount bracket. Max power 15W at 4 ohm.

B. Design Make: OWI – AMPLV602

2.5 CEILING SPEAKER (OWNER FURNISHED)

A. Description: 2’x2’ ceiling tile replacement speaker consisting of 6.5" 2-way Complex Conic Loudspeaker. Max power 15W at 4 ohm.

B. Design Make: OWI – 2X2VG-HDTR

C. **Contractor** provided accessories:

1. Ceiling Cross-Tee

2.6 ASSISTIVE LISTENING SYSTEM JACKS

A. Design Make: Panduit – NK35MSSIW

2.7 BLUETOOTH AUDIO RECEIVER (OWNER FURNISHED)

A. Description: Stereo Bluetooth audio receiver with Aux inputs and volume control.

B. Design Make: OWI – AMP-BTVC

2.8 TWISTED PAIR HDMI TRANSMITTER (OWNER FURNISHED)

A. Description: Twisted Pair transmitter for HDMI with resolution up to 1080p.

B. Design Make: Tripp Lite P167-000

2.9 HDMI CABLE, 6' (OWNER FURNISHED)

A. Description: 4K high-speed HDMI cable. 6’

2.10 AUDIO/CONTROL CABLE

A. Description: 3#22 AWG, audio signals cable.

B. Design Make: West Penn 450

2.11 SPEAKER CABLE

A. Description: 2#16AWG speaker cable.

B. Design Make: West Penn 25225B

PART 3 - EXECUTION

3.1 COORDINATION:

A. Coordinate final mounting requirements for AV equipment with field conditions.

B. PRIOR TO INSTALLATION:

1. Refer to section 1.4B for all pre-installation submittal requirements.

3.2 INSTALLATION OF EQUIPMENT:

A. Use hook and loops fasteners to secure all cabling. Provide 6’ cable coil to allow for equipment rack to be fully removed from the cabinet for service.

B. Install twisted pair cabling to each of the remote video transmitters and receivers. Terminate with mpdular plugs on both ends per T568B. Cabling runs through ceiling shall be properly supported every 48”. Provide a 6’ service loop in the ceiling.

C. Speakers:

1. Coordinate final installation locations with the owner.

2. Mount speakers to the wall with proper support and anchors.

3. Speaker cabling runs through the ceiling shall be properly supported every 48”.

D. Spares

1. Any unused parts and cables shall be turned over to the owner at the completion of the project.

3.3 LABELING AND IDENTIFICATION

A. Labeling requirements shall comply with INFOCOMM F501.01:2015 Cable Labeling for Audiovisual Systems.

B. Provide pre-printed labels at all faceplates and equipment clearly indicating connection and function.

C. Labels shall meet the legibility, defacement, exposure, and adhesion requirements of UL 969.

D. All labels shall be preprinted or laser printed type.

E. All cables shall be labeled at both ends. Provide a vinyl substrate with a white printing area and a clear “tail” that self laminates the printed area when wrapped around the cable. If cable jacket is white, provide cable label with printing area that is any other color than white, preferably orange or yellow – so that the labels are easily distinguishable.

F. At project closeout provide as-built drawings showing all connections using the same labeling convention as the installed system. See section 1.4C.3 for additional details.

3.4 TESTING AND COMMISSIONING

A. The contractor shall inspect and test the entire video system and control system. The system check shall include verifying the proper operation of all electronic components.

B. The commissioning process will be performed in conformance with ANSI/INFOCOMM 10:2013 – Audiovisual Systems Performance Verification. Verification reports will be issued at the end of the pre-integration, integration, post-integration, and closeout verification phases.

C. The contractor shall be responsible to make up two site visits in the first three months of owner occupancy to perform requested adjustments to projector image, volume gain, etc.

3.5 WARRANTY

A. Provide a minimum 1-year parts and labor warranty on the system and wiring.

B. The warranty will not begin until the equipment has been tested and accepted by the owner.

C. Include in submittal the duration and terms of the manufacturer’s warranty.

D. Include in proposal the duration and terms of your organization’s warranty.

END OF SECTION 274100

SECTION 283100
FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section of the specifications includes the furnishing, installation, and connection of the microprocessor controlled, addressable reporting emergency voice communication system fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to transponder panels, alarm initiating devices, alarm notification appliances, auxiliary control devices, and connections to existing campus Fire Alarm Control Panel network.

B. This Section includes the furnishing of all labor, equipment, materials, and performance of all operations associated with the installation of the emergency voice communication Fire Alarm System as required by the drawings and specified herein.

C. The intent of drawings and specifications is to result in a complete and functional networked Fire Alarm System as described herein.

1.2 SCOPE:

A. The Contractor shall furnish and install transponder panels, initiation devices and circuits, notification appliances and circuits, control relays, monitor modules and supervisory devices, as required to accomplish this intent whether or not specifically shown or specified.

B. The complete installation shall conform to the applicable sections of NFPA 72, state code requirements and the 2022 California Electrical Code with particular attention to Article 760.

C. The work specified herein shall be coordinated with the related work as specified elsewhere under the project specifications.

1.3 SUBMITTALS

A. Submittals for this Section shall be made according to the Conditions of the Contract, Division 01 Specification Sections and Specification Section 260100.

B. General:

1. Five copies of all submittals shall be submitted to the Architect/Engineer for review.

2. 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. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

3. Show remote annunciator(s) layout, configurations, and terminations.

4. Shop drawings shall show valid Contractor’s C-10 license, wet-signed by C-10 license holder.

D. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manual listing the manufacturer's name(s) including technical data sheets.

2. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.

3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

E. 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. Include names and addresses in the certification.

1.4 WARRANTY

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 and is part of this Contract.

1.5 APPLICABLE STANDARDS:

A. The specifications and standards listed below form a part of this specification. The system shall fully comply with these standards.

1. 2022 NFPA 72 National Fire Alarm Code

2. 2022 California Electrical Code (CEC)

3. 2022 California Fire Code (CFC)

4. 2022 California Mechanical Code (CMC)

5. 2022 California Building Code (CBC)

6. Underwriters Laboratories Inc. (UL) - USA:

7. California State Fire Marshal

8. All requirements of the Authority Having Jurisdiction (AHJ).

1.6 APPROVALS:

A. The system shall have proper listing and/or approval from the following nationally recognized agencies:

1. UL Underwriters Laboratories Inc.

2. CSFM California State Fire Marshal

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

1. This Fire Alarm System design is based on the use of microprocessor-based addressable fire alarm control and initiation equipment manufactured by Gamewell-FCI, and notification appliances manufactured by Wheelock.

2.2 FIRE ALARM TRANSPONDER PANEL:

A. The Fire Alarm Transponder Panel shall be the Gamewell-FCI INX Series. The Fire Alarm Transponder Panel shall have the capacity to support two (2) separate addressable signal loop circuits. It shall be capable of networking with the new Gamewell-FCI E3 Series Fire Alarm Control Panel network on the campus. The fire alarm transponder panel shall be complete with cabinets, batteries, battery charger and all miscellaneous components required for a complete and fully functional networked fire alarm system.

B. Batteries:

1. Shall be maintenance free, VRLA AGM lead-acid type.

2. Batteries shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 15 minutes of alarm upon a normal AC power failure.

3. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

2.3 INITIATION DEVICES

A. Smoke Detectors

1. Addressable Photoelectric Smoke Detectors

a. Smoke detectors shall be addressable and shall connect with two wires to the Fire Alarm Control Panel Signaling Line Circuit.

b. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density.

c. The detectors shall be low profile ceiling-mount and shall include a twist-lock base.

d. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a switch) or initiated remotely on command from the control panel.

e. The detectors shall store an internal identifying code that the control panel shall use to identify the type of detector.

f. The detectors shall provide an alarm and power LED. The LED shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel. The LED is placed into steady illumination by the control panel indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED.

B. Heat Detectors

a. Attic Heat Detectors shall be the fixed high temperature (200-deg F) type approved for 50ft spacing.

2.4 TRANSPONDERS

A. Operate in peer-to-peer fashion with other panels and transponders in system.

1. Each transponder shall store copy of audio evacuation messages and tones.

B. System shall be of multiprocessor design to allow maximum flexibility of capabilities and operation. INX shall receive, transmit, and regenerate voice, fire fighter phones, and data over single pair of wire or fiber optic cable.

C. INX shall provide full multi-channel distributed voice messaging, with integrated switching amplification, and SLC and extended phone riser. INX shall communicate with network system in true peer-to-peer fashion operating at 625 K baud over any combination of fiber or wire media. INX shall consist of the following units and components.

D. System Cabinet: System cabinet shall be surface or semi-flush mounted with texture finish and shall consist of 4 parts, back box, back plate, inner door, and outer door.

E. Power Supply Module (PM-9): PM-9 power supply shall supply all power necessary under normal and emergency conditions. Power supply shall provide capacity to charge up to 55 amp-hour batteries while under full load. Technology used shall be of power-saving switching configuration, eliminating need of stepping transformer.

2.5 NOTIFICATION APPLIANCES

A. Speakers

1. ADA/NFPA/ANSI compliant

2. Complies with OSHA 29 Part 1910.165

3. Field selectable taps for 25 or 70 VRMS operation from 1/8 watt up to 2 watts (indoor), 1/8 watt up to 8 watt (outdoor)

4. Fast installation with IN/OUT screw terminals using #12 to #18 AWG wires

5. Optional Extender (E60 Ext) is for mounting to 4” backboxes with no extension ring.

6. Weatherproof with extended temperature range of –40°F to 150°F (-40°C to 66°C)

B. Strobes

1. Strobes are visual notification appliances for the hearing impaired.

2. Strobes shall operate on 24 VDC nominal.

3. Strobes shall meet the requirements of the ADA (Americans with Disabilities Act) as well as UL Standard 1971 and CBC.

4. Strobes shall be flush mounted in an electrical box in accordance with the manufacturer’s installation instructions.

C. Combination Speaker/Strobes

1. ADA/NFPA/ANSI compliant

2. Complies with OSHA 29 Part 1910.165

3. Ceiling mount strobe models are available with field selectable candela settings of 15/30/75/95cd or 115/177cd (Multi-candela models)

4. Strobes produce 1 flash per second over the regulated voltage range

5. 24 VDC with wide UL “Regulated Voltage” using filtered DC or unfiltered VRMS input voltage

6. Field selectable taps for 25 or 70 VRMS operation from 1/8 watt up to 2 watts

7. Fast installation with IN/OUT screw terminals using #12 to #18 AWG wires

8. Optional Extender (E60 Ext) is for mounting to 4” backboxes with no extension ring.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Installation shall be in accordance with the CEC and NFPA 72 as shown on the drawings, and as recommended by the equipment manufacturer.

B. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

3.2 WIRING INSTALLATION

A. Fire Alarm System initiation device circuits and notification appliance circuits shall be installed in conduit. The minimum conduit size shall be ¾".

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C. Power-Limited Circuits: CEC Types FPL, FPLR, or FPLP, as recommended by manufacturer.

D. Each Fire Alarm Control Panel and Fire Alarm Booster Power Panel shall be connected to a separate dedicated 120V, 20A branch circuit with a dedicated neutral conductor and an equipment grounding conductor. The circuit breakers shall be painted red and shall be labeled at the panelboard as "FIRE ALARM CIRCUIT". Fire Alarm Booster Power Panel Primary Power wiring shall be 12 AWG. The Fire Alarm Panel cabinet shall be grounded.

3.3 GROUNDING

A. Ground cable shields and equipment according to system manufacturer's written instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding.

3.4 PROGRAMMING

A. The Contractor shall provide all programming of the Fire Alarm System to result in a complete and functional Fire Alarm System in accordance with all applicable codes and standards, and as specified herein.

B. Remote Monitoring Station

1. Contractor shall coordinate with the Remote Monitoring Station and program the system to report the number of points purchased by the Owner. Prior to the start of programming, Contractor shall verify how many point signals, above and beyond minimum code requirements, shall be transmitted to the monitoring station with Owner.

3.5 IDENTIFICATION AND DOCUMENTATION

A. Zone Map – The Contractor shall create an 11"x17" site plan identifying each building and identifying the zones. The zone map shall be created by a CAD program and shall be posted under plastic cover at the location of the fire alarm control panel.

B. Device Location Map – For each building the Contractor shall create an 11"x17" floor plan of the building showing the location of each device and the device address as it is annunciated at the control panel and remote annunciator. The device location map shall

be created by a CAD program and shall be posted under plastic cover at the location of the fire alarm control panel or fire alarm booster power supply within each building.

C. Paint each circuit breaker handle for the branch circuits that supply power to the Fire Alarm Control Panel and Fire Alarm Booster Power Panels red and label "FIRE ALARM CIRCUIT."

3.6 FIRE WATCH

A. The Contractor shall provide a fire watch during the course of construction where any portion of the campus is rendered unprotected by the fire alarm system. The Contractor shall provide a 24-hour fire watch each day until the fire alarm system is fully operational. All costs of the fire watch shall be borne by the Contractor.

3.7 ACCEPTANCE TESTING AND CERTIFICATION

A. Prior to the final acceptance test provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system:

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

2. Open initiating device circuits and verify that the trouble signal actuates.

3. Open and short signaling line circuits and verify that the trouble signal actuates.

4. Open and short Notification Appliance Circuits and verify that trouble signal actuates.

5. Ground all circuits and verify response of trouble signals.

6. Check presence and audibility of tone at all alarm notification devices.

7. Check installation, supervision, and operation of all addressable smoke detectors using the Walk Test.

8. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

9. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying the controls performance by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

B. At the final inspection a manufacturer-trained representative shall demonstrate that the system functions properly in every respect.

C. Upon completion of the installation, a test of the entire system shall be performed in the presence of the Inspector of Record and the local authority having jurisdiction. The local Fire Marshal shall be notified and invited to witness the test a minimum of 72 hours prior to the test. Components and functions of the system shall be tested and an Inspection

and Testing Record Form shall be generated in accordance with NFPA 72 indicating the proper functioning of each component of the system.

D. If devices or other components of the system fail during testing the defective devices or components shall be removed and immediately replaced with functional units and the test shall be repeated.

E. Complete the NFPA 72 Record of Completion, testing all devices and appliances. Provide a copy of the completed Record of Completion to the Owner (School District), Architect, Local Fire Authority and DSA via the Project Inspector.

3.8 INSTRUCTION

A. Provide instruction as required for operating the system. "Hands-on" demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided. The Contractor and/or the Systems Manufacturer's representatives shall provide a typewritten "Sequence of Operation" to the Owner.

B. The Contractor shall furnish a reduced set of “as-built” record drawings on 11”x17” bond paper in a plastic cover showing locations of all devices and the proper address of the device as it is displayed on the LCD annunciator at the fire alarm control panels and/or remote annunciators. This reduced set shall be located adjacent to the fire alarm control panel for the reference of the Authority Having Jurisdiction.

3.9 CLOSEOUT SUBMITTAL

A. The Contractor shall submit closeout submittal documentation consisting of the following items:

1. Full size fire alarm “as-built” record drawings; drawings shall show valid Contractor’s C-10 license, wet-signed by C-10 license holder.

2. Device cut sheets and CSFM listing services;

3. A copy of the Fire Alarm System Record of Completion signed by the Installer and the Inspector of Record;

4. Owner’s Manuals and Operating Instructions.

END OF SECTION 283100

SECTION 31100
SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY:

A. This Section includes the following:

1. Provide all material, labor, equipment, and services necessary to completely clear and demolish all materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.

B. RELATED SECTIONS:

1. Contract General Conditions and Division 1, General Requirements
2. Section 312000 – Earthwork: Excavation, Filling, and Grading
3. Section 312222 – Soil Materials

1.3 SUBMITTALS

(NOT APPLICABLE)

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. In accordance with Specification Section GENERAL REQUIREMENTS, and the following:

a. Materials and equipment used for this project shall comply with the current applicable regulations of the California Air Resources Board [CARB] and the Environmental Protection Agency [EPA].

B. Meetings:

1. Minimum agenda shall be to discuss coordination of upcoming work, review the work progress, discuss field observations, identification of any potential problems which may impede planned progress; corrective measures to regain projected schedule; and maintenance of quality and work standards.
2. Meetings shall include Pre-Clearing and Demolition Meetings.

3. Participants (or designated representative of) invited to attend each of the above meetings shall be as follows:

    a. Contractor.
    b. Owner.
    c. Architect.
    d. Testing Laboratory.
    e. Local Governing Authorities as applicable.
    f. Utility Representatives as applicable.
    g. Owner's Inspector.
    h. Clearing and Demolition Subcontractor.
    i. Other subcontractors, as appropriate (including any accessory subcontractors).

1.5 PROJECT CONDITIONS OR SITE CONDITIONS

A. Dust Control

1. Contractor shall comply with all requirements of the San Joaquin Valley Air Pollution Control District (SJVAPCD) for construction activity related to this project.
2. A Dust Control Plan, as required by the SJVAPCD, may be required for this project. Contractor shall be responsible for preparing said Dust Control Plan, submitting to the SJVAPCD for review and approval, and paying all SJVAPCD review and permitting fees related to the Dust Control Plan.
3. No construction activity related to this project may begin until Contractor has secured an approved Dust Control Plan, if one is required.
4. Contractor shall be solely responsible to implement all requirements of the Dust Control Plan throughout the life of this contract.
5. Should fines or fees be levied against the Project for violations of the Dust Control Plan and/or related SJVAPCD regulations, Contractor shall be responsible to pay all said fines or fees and to implement all mitigation measures required by SJVAPCD in order to bring the construction activity into compliance with SJVAPCD regulations. The costs for any such fines or fees shall be included in the lump sum price bid for work under this contract and no additional payment will be made therefor.

B. Existing Conditions:

1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
2. Conduct work so as not to interfere unnecessarily with adjacent roads, streets, drives, walks or occupied facilities.

    a. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and Authorities having jurisdiction.

b. Provide alternate routes around closed or obstructed traffic ways if required by Authorities having jurisdiction.

3. Locate and identify utilities.

a. Call a Local Utility Locator Service (USA – “Underground Service Alert” – [800] 227-2600) for the task of locating any applicable utilities in the area where the Project is located.

4. Carefully remove items indicated to be salvaged and store on Owner’s premises at the Owner’s direction.

PART 2 - PRODUCTS

(NOT APPLICABLE)

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordination:

1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.

B. Protection:

1. Protect and maintain all benchmarks and survey control points from disturbance during clearing and demolition operations.
2. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties.
3. Furnish and install temporary protection/barrier fencing surrounding the limits of demolition.
4. Protect trees, plant growth, and features not specifically designated for removal. Locate and clearly flag trees and vegetation to remain or to be relocated.
5. Protect existing improvements designated to remain from damage during construction.

a. Restore damaged improvements to their original condition, as acceptable to the Owner.

3.2 CONSTRUCTION

A. Shrub and Weed Removal:

1. Remove weeds and rooted topsoil to a minimum four (4) inch depth and temporarily stockpile as needed for re-use in finished grading of landscape areas. Remove excess material from the site.
2. Where existing vegetation is to be replaced by new materials, remove contaminated or excess soil from the site and legally dispose of off-site.

B. Existing Site Improvements Removal:

1. Remove existing above and below grade improvements as necessary to facilitate new construction.

    a. Remove concrete slabs, sidewalk, curbs, mow strips, gutters, and fence post footings.

        1) Neatly saw-cut length of existing pavement to remain before removing existing pavement unless existing full-depth joints coincide with line of demolition. Saw-cut faces vertically.

    b. Remove indicated utility improvements within the limits of construction.

        1) Excavate for and disconnect utilities designated to be removed. Seal or cap off underground.
        2) Coordinate removal and/or relocation of utilities with the appropriate utility agencies.

    c. Where existing underground utilities, irrigation pipes, wells, leach fields, or underground tanks are encountered, they must be removed or moved to a point at least 5 feet horizontally outside the proposed building and 3 feet horizontally outside the concrete flatwork or pavement construction areas. All resultant cavities must be backfilled with engineered fill.

C. Existing Utilities to Remain or be Relocated:

1. Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

    a. Notify Architect and the Owner not less than seven (7) days in advance of proposed utility interruptions.
    b. Arrange to shut off indicated utilities with utility companies and Owner.

D. Disposal:

1. Legally dispose of all debris (surplus soil materials, unsuitable topsoil, obstructions, demolished materials, waste materials, trash, etc.) resulting from clearing, grubbing, demolition and from construction. Disposal of all materials shall be at a location secured by the Contractor off of the Owner's property.

END OF SECTION

SECTION 312000
EARTHWORK: EXCAVATION, FILLING AND GRADING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY:

A. This Section includes the following:

1. Excavating soil and other material for surface improvements.
2. Placing fill.
3. Compaction of existing ground and fill.
4. Preparation of subgrade for other improvements.
5. Grading of soil.

B. RELATED SECTIONS

1. Contract General Conditions and Division 1, General Requirements
2. Section 311100 – Site Clearing
3. Section 312222 – Soil Materials

1.3 REFERENCES

A. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

1.4 DEFINITIONS

A. Utility: Any buried or above ground pipe, conduit, cable, associate device or appurtenances, or substructure pertaining thereto.

1.5 SUBMITTALS

A. Product Data:

1. Information indicating the source of all import material, the fill material type and where it is to be used, and approval of the District's Inspector of Record for incorporation of import material into the Work.

B. Material Test Reports:

1. Classification of Soils.
2. Compaction Characteristics of Soils.
3. Density and Unit Weight of Soils in Place.
4. Imported fill shall be tested and approved by the Owner’s Geotechnical Engineer prior to import to the site, including testing for compliance with Department of Toxic Substances Control (DTSC) guidelines. Said testing and certification documents shall be paid for by the Owner.

C. Project Closeout: In accordance with Specification Section PROJECT CLOSEOUT.

1. Drawings indicating the extent and depth of all engineered fill, and overexcavation and recompaction. This information shall be a part of the Project “As-Built” and Project “Record” Documents in accordance with the Specification Section PROJECT DOCUMENTS.

1.6 QUALITY ASSURANCE

A. Installer:

1. Qualifications:

a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this project within the past 5 years.

B. Regulatory Requirements:

1. In accordance with Specification Section REGULATORY REQUIREMENTS and the following:

a.	CARB	Materials and equipment used for this Project shall comply with the current applicable regulations of the California Air Resources Board [CARB].
b.	CM	City of Merced, Codes and Ordinances
c.	EPA	Environmental Protection Agency.
d.	CAL/OSHA	Comply with all provisions of the Construction Safety Orders and the General Safety Orders of the California Division of Occupational Safety and Health, as well as all other applicable regulations as they pertain to the protection of workers from the hazard of caving ground excavations.

e. DTSC — Comply with all recommendations of the California Department of Toxic Substance Control (DTSC) regarding soil testing for potential contaminants.

C. Certificates:

1. Installer's certification that all Earthwork installation meets or exceeds the requirements of this specification.
2. Contractor's certification (on Contractor's letterhead paper) that the Earthwork materials and installation meets or exceeds the requirements of this specification.

D. Meetings:

1. Pre-Installation: Schedule prior to the start of work.

   a. Coordinate the work with other work being performed.
   b. Identify any potential problems, which may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.

2. Progress: Scheduled by the Contractor during the performance of the work.

   a. Review for proper installation of work progress.
   b. Identify any installation problems and acceptable corrective measures.
   c. Identify any measures to maintain or regain project schedule if necessary.

3. Completion: Scheduled by the Contractor upon proper completion of the work.

   a. Inspect and identify any problems which may impede issuance of warranties or guaranties.
   b. Maintain installed work until the Notice of Substantial Completion has been filed.

1.7 COORDINATION

A. Coordinate work with Owner's personnel.

B. Provide required notification to the Owner and Geotechnical Engineer or the Engineer of Record so that a representative from the Owner's Geotechnical Engineering consultant can be present for all excavation, filling and grading operations to test and observe earthwork construction.

C. Verify that the location of existing utilities have been indicated at work site by utility authorities, by Owner, and as specified on the Plans.

1.8 EXISTING CONDITIONS

A. Existing Conditions:

1. Examine the site and verify conditions with the Drawings and Specifications.

Contractor shall familiarize himself with existing site conditions and any changes that have occurred at the site since the preparation of the contract documents, and shall be responsible to account for any such changes in the price bid for this work.

2. Thoroughly investigate and verify conditions under which the Work is to be performed.
3. Locate and identify utilities:

    a. Call a Local Utility Locator Service (USA - “Underground Service Alert” – [800] 227-2600) for the task of locating any applicable off-site and on-site utilities in the area where the Project is located.

4. No allowance for Extra Work will be granted resulting from negligence or failure to meet requirements of this Section.

B. Where subsurface work involves more than the normal depth of excavation required for the removal and/or construction of surface improvements (surface improvements such as concrete flatwork, paving, landscaping, signs, etc.), the Engineer will have made a diligent attempt to indicate on the plans the location of all main and trunk line utility facilities which may affect the Work. In many cases, however, the only available information relative to the existing location of said facilities may have been small scale undimensioned plats. The locations of said facilities, therefore, shall be considered approximate only, until exposed by the Contractor.

C. Under similar circumstance, service laterals and appurtenances will have also been shown where information was available as to their location. In many cases, however, the only available information relative to the existing location of said facilities may have been small scale undimensioned plats. The locations of said facilities, therefore, shall be considered approximate only, until exposed by the Contractor.

D. Determine exact location of existing buried utilities by:

1. Marking on ground or pavement surface the alignment and extent of the facilities and the probable location of existing utilities using construction plans and existing surface features.
2. Requesting Underground Service Alert (USA) to indicate location of existing buried facilities (phone 1-800-227-2600). Provide USA a minimum of two (2) working days notice of request for locations, and notify Owner of said request concurrently.
3. Confirm exact location of existing utilities by hand methods of excavation, or by use of vacuum equipment.

E. At proposed work location, expose by hand methods (or vacuum equipment) all existing utilities along the route of the proposed work prior to using any mechanical equipment. If mechanical equipment is allowed at a particular location, it may only be used after the completion by the Contractor of a successful exhaustive search by hand (or vacuum equipment) methods to locate all existing facilities as indicated on the plans, and/or as indicated on the ground by USA or Owner’s personnel.

F. Provide Field Engineering to record the location of all utilities encountered. Where locational conflicts exist between existing utilities and the planned location of facilities to be constructed under this Contract, submit detailed information to the Engineer for review and direction.

G. Maintain all existing utility mains and service lines in constant service during construction of the Work.

H. Where service disruptions are allowed, minimize the length of such disruptions by proper scheduling and diligent pursuit of the work, and coordinate the timing of any such disruptions in advance with the District.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Dust control: Perform work in a manner as to minimize the spread of dust and flying particles. Thoroughly moisten all surfaces as required to prevent dust from being a nuisance to the public, neighbors and concurrent performance of other on-site work.

1. All disturbed areas, including storage piles, which are not being actively utilized for construction purposes, shall be effectively stabilized of dust emissions using water, chemical stabilizer/suppressant, or vegetative ground cover.
2. All land clearing, demolition, grubbing, scraping, excavation, land leveling, grading, and cut and fill activities shall be effectively controlled of fugitive dust emissions utilizing application of water or by pre-soaking.
3. When materials are transported off-site, all material shall be covered, effectively wetted to limit visible dust emissions or at least six inches of freeboard space from the top of the container shall be maintained.
4. All operations shall limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at least once every 24 hours when operations are occurring. The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions. The use of blower devices is expressly forbidden.
5. Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles shall be effectively stabilized of fugitive dust emissions utilizing sufficient water or chemical stabilizer/ suppressant.

    a. Contractor shall comply with all requirements of the San Joaquin Valley Air Pollution Control District (SJVAPCD) for construction activity related to this project.
    b. A Dust Control Plan, as required by the SJVAPCD, may be required for this project. If required, Contractor shall be responsible for preparing said Dust Control Plan, submitting to the SJVAPCD for review and approval, and paying all SJVAPCD review and permitting fees related to the Dust Control Plan.
    c. If a dust control plan is required, no construction activity related to this project may begin until Contractor has secured an approved Dust Control Plan.

d. Contractor shall be solely responsible to implement all requirements of the Dust Control Plan throughout the life of this contract.
e. Should fines or fees be levied against the Project for violations of the Dust Control Plan and/or related SJVAPCD regulations, Contractor shall be responsible to pay all said fines or fees and to implement all mitigation measures required by SJVAPCD in order to bring the construction activity into compliance with SJVAPCD regulations. The costs for any such fines or fees shall be included in the lump sum price bid for work under this contract and no additional payment will be made therefore

B. Burning: No burning will be allowed on-site.

C. Rain: Work under this section shall not be started or maintained under threat of rain, unless the work is not affected by the rain.

D. Do not place fill during weather conditions which will alter moisture content of fill materials sufficiently to make compaction to the specified densities difficult or impossible.

E. When reference is made to SWPPP (Storm Water Pollution Prevention Plan), if any within this Project Manual, then comply with all environmental protection requirements included therein.

F. In accordance with EPA, CARB and CV.

G. Protection:

1. Protect cut and fill areas to prevent water running into excavation. Maintain areas free of water. Remove seeping water immediately by pumps. Provide dewatering as necessary.
2. Protect cut slopes from erosion due to precipitation and other sources of runoff.
3. Protect utilities to remain within the construction area and special construction. If utility lines are uncovered (water, electric, sewer, etc.) not shown on the drawings during excavation of site, notify the Architect promptly for its review and action.
4. Do not permit access to undeveloped portions of the site, nor to areas that are outside of the limits of grading.

H. Before being brought onto the site, all import soil must be sampled, tested and approved by Owner's Geotechnical Engineer. All import material must comply with DTSC recommendations and guidelines for environmentally clean soil suitable for school construction. Import testing will be provided and paid for by the Owner.

1.10 PROJECT RECORD DOCUMENTS

A. Submit under provisions of GENERAL CONDITIONS and DIVISION 1, GENERAL REQUIREMENTS.

B. Accurately record actual locations of utilities encountered including depth and horizontal location, as measured from permanent site features.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fill in Turf or Other Planting Areas: Type S2 or S3 per Division 31 Specification Section SOIL MATERIALS.

B. Fill in Non-planting Areas: Type S1, S2 or S4 per Division 31 Specification Section SOIL MATERIALS.

C. Imported material: Type S3, S4 or S5 per Division 31 Specification Section SOIL MATERIALS.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions.

3.2 PREPARATION

A. Layout of Work:

1. Contractor shall be responsible for all lines and grades. Layout shall be provided by a California registered Land Surveyor or Civil Engineer, at Contractor's expense.
2. Check all bench marks, monuments and property lines and verify locations.
3. Locate and maintain all grade stakes.
4. Monuments moved or displaced during grading operation are to be replaced by a California Registered Civil Engineer or Surveyor, at Contractor’s expense.

B. Locate, identify, and protect existing above and below grade utilities from damage.

C. Protect plant life, lawns, trees, shrubs, and other features not authorized for removal.

D. Protect existing structures, fences, curbs, sidewalks, paving and other improvements to remain from damage from excavation equipment and vehicular traffic.

E. Employ equipment and methods appropriate to the work site.

F. Protect excavated areas from drainage inflow, and provide for drainage of all excavated areas.

G. Comply with all provisions of the Construction Safety Orders and General Safety Orders of the California Division of Industrial Safety, as well as all other applicable regulations as they pertain to the protection of workers from the hazard of caving ground in excavations.

3.3 SITE STRIPPING:

A. Reference is made to Division 31 Specification Section SITE CLEARING.

B. Within the areas of planned surface improvements and structures, the near surface soils containing vegetation, roots, organics, or other objectionable material must be stripped and removed from the site. Upon approval of the Geotechnical Engineer, suitable materials stripped from the site may stockpiled and incorporated into the finish fill for planting areas.

C. All areas to receive surface improvements shall be stripped to remove turf, shrubs, trees and other vegetation, along with associated root systems, concrete, wood, metal, rubbish and other unsuitable debris, and any loose, saturated or unconsolidated soil material. Minimum stripping depth is expected to be 4-inches below existing site grades. Stripping shall continue to the depth required to expose acceptable basement soils that are free from deleterious materials which are not suitable for Engineered Fill, as required by the Geotechnical Engineer.

3.4 EXCAVATION

A. Following clearing and stripping operations, excavate planned construction areas as specified in this Section.

B. Provide additional excavation as required to conform to the lines, grades and cross-sections shown on the plans.

C. When excavating through tree roots, perform work by hand and cut roots, where authorized, with a saw. Remove all roots ¼” in diameter and greater.

D. Remove excess soil not to be used as fill in the Work from the site. Unless requested by Owner to be deposited at a site designated by Owner on the property, obtain a disposal site and legally dispose of said excess material, all at no additional cost to the Owner.

E. Areas disturbed by demolition must be excavated to expose undisturbed soils.

F. Excavated soils free of deleterious substances (organic matter, demolition debris, tree roots, etc.) and with less than 3% organic content by weight, may be returned to the excavations as Engineered Fill.

G. Over-excavate the area to receive new buildings to a depth of 2 feet below the existing site grade or 1 foot below the bottom of proposed foundations, whichever is deeper. Over-excavation shall extend 5 feet laterally past the edges of the foundations. Scarify,

backfill, and compact as noted in Section 3.5

H. Subgrade under site improvements should be scarified to a depth of 12 inches and compacted per Section 3.5.

3.5 FILLING AND COMPACTING

A. Once clearing, stripping and over-excavation operations are complete, scarify the surface to receive fill material or improvements to a depth of 8-inches, moisture condition to at least 2% above optimum moisture content, and compact to a minimum of 90% of maximum dry density based on ASTM Test Method 1557.

B. Place and compact soil to finish subgrade of improvements to be placed thereon, or to finished surface grade where no improvements are to be placed thereon.

C. All fill required shall be placed as Engineered Fill.

D. The Contractor shall be solely responsible for securing an acceptable source of import material as required to grade the site. Reference is made to 31 20 00 1.9.H.

E. On-site soils are suitable for re-use as Engineered Fill, providing they are cleansed of excessive organics (less than 3 percent by weight, ASTM D2974), debris, and fragments larger than three (3) inches in maximum dimension and meet the requirements of soil Type S4, Division 31 Specification Section SOIL MATERIALS.

F. Engineered Fill shall be moisture conditioned to within 2% of optimum moisture, placed in uncompacted layers not exceeding eight (8) inches in thickness, and compacted as specified, based on ASTM Test Method D1557.
   1. Non-vegetative surface improvement areas (structures and site concrete improvements) - To a minimum of 90% of maximum dry density.
   2. Non-vegetative surface improvements areas to receive asphalt pavement – To a minimum of 95% of maximum dry density
   3. Vegetative surface improvement areas (turf and planters) - Below top twelve (12) inches - to a minimum of 90% of maximum dry density. Top twelve (12) inches - 85% of maximum dry density.

G. Maintain optimum moisture content of fill materials to attain required compaction density.

H. Additional lifts shall not be placed if the previous lift did not meet the required dry density, or if soil conditions are not stable.

I. Conform fill to the lines, grades and cross-sections shown on the plans.

J. Fill materials to conform to Division 31 Specification Section SOIL MATERIALS.

K. Provide, at no additional cost to Owner, imported soil material conforming to the requirements of Division 31 Specification Section SOIL MATERIALS, as needed to attain finished grades of Work.

L. Utilize equipment which will not disturb or damage existing utilities and other improvements.

3.6 PREPARATION OF SUBGRADE FOR SURFACE IMPROVEMENTS

A. Where concrete, asphalt-concrete, aggregate base, or other non-vegetative surface improvements, or a layer of said surface improvements, are to be constructed on the soil surface, prepare the subgrade for said improvements in accordance with this section.

B. Scarify the soil as specified and remove and dispose of (off the project site) all rocks, hardpan chunks or otherwise unsuitable material over 2.5 inches in size.

C. Thoroughly moisture condition and compact as described above.

D. Prior to commencing construction of surface improvements, pass a test roller of size and weight as approved by the Owner over the subgrade to establish the extent of soft or spongy areas requiring repairs.

E. Conform finished subgrade surface to the lines, grades and cross-sections shown on the plans.

3.7 FINE GRADING

A. Fine grade all finished surfaces to the lines, grades and cross-sections shown on the plans, and to blend to hard surface improvements.

B. Rake and smooth all finished surfaces not to receive hard surface improvements.

C. Use suitable stockpiled or imported topsoil for the top 12-inches of areas to receive landscape improvements.

D. Import topsoil meeting the requirements of Division 31 Specification Section SOIL MATERIALS, as required to complete finish grading.

E. Topsoil may not be used in areas requiring Engineered Fill.

3.8 TOLERANCES

A. Top surface of Subgrade for Non-Vegetative Surface Improvements or Layers thereof: Plus or minus 0.02 foot from planned elevation.

B. Top surface of Subgrade for Vegetative Surface Improvements or for Bare Ground - Plus or minus 0.05 foot of planned elevation, or as required for finish surface to match adjacent improvements or ground.

3.9 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of GENERAL CONDITIONS and/or DIVISION 1, GENERAL REQUIREMENTS.

B. Compaction testing will be performed in accordance with ANSI/ASTM D1557.

C. If tests indicate work does not meet specified requirements, recompact, or remove and replace, and retest.

D. All retesting required as a result of failure of initial test will be performed by Owner's testing agency, at the expense of the Contractor.

3.10 PROTECTION

A. Protect graded areas from traffic, freezing, erosion, and all other sources of damage. Keep free of debris and trash.

B. Repair and re-establish grades to specified tolerances where completed or partially completed work becomes eroded, rutted, settled, or where it is damaged by subsequent construction operations or weather.

C. Where settlement occurs prior to acceptance of the work, remove and replace surface improvements, excavate, replace, and re-compact in accordance with these specifications, and restore the surface improvements.

3.11 CLEANING

A. Remove all surplus or unsatisfactory soil material, trash, and debris, and legally dispose of off of the Owner's property.

END OF SECTION

SECTION 312222
SOIL MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY:

A. SECTION INCLUDES
1. Excavated (and re-used) materials and imported materials.

1.3 RELATED SECTIONS:
1. Contract General Conditions and Division 1, General Requirements
2. Section 312000 - Earthwork: Excavation, Filling and Grading

1.4 SUBMITTALS

A. Samples: Submit, in air-tight containers, 10 lb. sample of Type S3, S4 and S5 fill to inspector.

B. Soil Analysis: Submit for Type S3, S4 and S5 soils to be imported.

C. Materials Source: Submit location of imported materials source. Provide materials from same source throughout the work. Change of source requires approval.

D. For imported soil, obtain Geotechnical Engineer and District approval prior to importing.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Soil Type S1: Excavated and re-used material, graded; free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.

B. Soil Type S2: Excavated and reused material, graded; free of roots, lumps greater than one inch, rocks larger than 1/2 inch, debris, weeds and foreign matter.

C. Soil Type S3: Imported topsoil, friable loam; reasonably free of roots, rocks larger than ½ inch, debris, weeds, and foreign matter.

D. Soil Type S4: Imported borrow, suitable for purposes intended, meeting the following characteristics:

1. Maximum Particle Size: 3”
2. Plasticity Index: < 9
3. Percent Passing #4 Sieve: 60-100
4. Percent Passing #200 Sieve: 20- 50
5. Expansion Index: <20
6. R-Value (in paved areas): >36
7. Low Corrosion Potential:

    a. Soluble Sulfates: < 2,000 mg/Kg
    b. Soluble Chlorides: < 500 mg/Kg
    c. Soil Resistivity: > 2,000 ohm-cm

E. Soil Type S5: Imported sand. Natural river or bank sand (sand equivalent greater than 30), washed; free of silt, clay, loam, friable or soluble materials, and organic matter.

2.2 SOURCE QUALITY CONTROL

A. Inspection of imported soil will be performed by the Geotechnical Engineer, at source of import and prior to being delivered to the site.

PART 3 - EXECUTION

3.1 STOCKPILING

A. Stockpile excavated or imported material onsite at location designated by project inspector.

B. Stockpile excavated or imported material in sufficient quantities to meet project schedule and requirements.

3.2 STOCKPILE CLEANUP

A. Remove stockpile, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

B. Dispose of excess material off-site.

END OF SECTION

SECTION 312333
TRENCH EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.1 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. Geotechnical Report prepared by Technicon Engineering Services

1.2 SUMMARY:

A. Section Includes

1. Excavating trenches, holes and pits for constructing the Work.
2. Backfill and compaction.
3. Providing suitable bedding and backfill material, as specified herein.

B. RELATED SECTIONS

1. Contract General Conditions and Division 01, General Requirements.
2. Section 311100 - Site Clearing
3. Section 312000 - Earthwork: Excavation, Filling and Grading
4. Section 312222 - Soil Materials
5. Section 331200 - Water Utilities
6. Section 334000 - Storm Drainage

1.3 REFERENCES

A. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

1.4 DEFINITIONS

A. Utility: Any buried or above ground pipe, conduit, cable, associate devices or appurtenances, or substructure pertaining hereto.

1.5 QUALITY ASSURANCE

A. Qualifications

1. Installer:

a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this project within the past 5 years.

B. Regulatory Requirements:

1. In accordance with Specification Section REGULATORY REQUIREMENTS and the following:

a.	CARB	Materials and equipment used for this Project shall comply with the current applicable regulations of the California Air Resources Board [CARB] and the Environmental Protection Agency [EPA].
b.	MC	Merced County, Codes and Ordinances
c.	EPA	Environmental Protection Agency.
d.	CAL/OSHA	Comply with all provisions of the Construction Safety Orders and the General Safety Orders of the California Division of Occupational Safety and Health, as well as all other applicable regulations as they pertain to the protection of workers from the hazard of caving ground excavations.

C. Certificates:

1. Installer's certification that all trench backfill installation meets or exceeds the requirements of this specification.
2. Contractor's certification (on Contractor's letterhead paper) that the trench backfill materials and installation meets or exceeds the requirements of this specification.

D. Meetings:

1. Pre-Installation: Schedule prior to the start of work.

a. Coordinate the work with other work being performed.
b. Identify any potential problems, which may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.

2. Progress: Scheduled by the Contractor during the performance of the work.

a. Review for proper installation of work progress.
b. Identify any installation problems and acceptable corrective measures.
c. Identify any measures to maintain or regain project schedule if necessary.

3. Completion: Scheduled by the Contractor upon proper completion of the work.

   a. Inspect and identify any problems which may impede issuance of warranties or guaranties.

4. Maintain installed work until the Notice of Substantial Completion has been filed.

1.6 COORDINATION

A. Coordinate work with Owner's personnel.

B. Verify that the location of existing utilities have been indicated at work site by utility authorities.

1.7 EXISTING UTILITIES

A. Where subsurface work involves more than the normal depth of excavation required for the removal and/or construction of surface improvements (surface improvements such as concrete work, paving, landscaping, signs, etc.), the Engineer will have made a diligent attempt to indicate on the plans the location of all main and trunkline utility facilities which may affect the Work. In many cases, however, the only available information relative to the existing location of said facilities may have been small scale undimensioned plats. The locations of said facilities, therefore, shall be considered approximate only, until exposed by the Contractor.

B. Under circumstance similar to 31 23 33/1.7A, service laterals and appurtenances will have also been shown where information was available as to their location. In many cases, however, the only available information relative to the existing location of said facilities may have been small scale undimensioned plats. The locations of said facilities, therefore, shall be considered approximate only, until exposed by the Contractor.

C. Determine exact location of existing buried utilities by:

1. Marking on ground or pavement surface the alignment and extent of the proposed facilities and the probable location of existing utilities using construction plans and existing surface features.
2. Requesting Underground Service Alert (USA) to indicate location of existing buried facilities (phone 1-800-227-2600). Provide USA a minimum of two (2) working days notice of request for locations, and notify Owner of said request concurrently.
3. Locate exact location of existing utilities by hand methods of excavation, or by use of vacuum equipment.

D. At proposed work location, expose by hand methods (or vacuum equipment) all existing utilities along the route of the proposed work prior to using any mechanical equipment. If mechanical equipment is allowed at a particular location, it may only be used after the completion by the Contractor of a successful exhaustive search by hand (or vacuum equipment) methods to locate all existing facilities as indicated on the

plans, and/or as indicated on the ground by USA or Owner's personnel.

E. Provide Field Engineering per Contract General Conditions and Division 1 to record the location of all utilities encountered. Where locational conflicts exist between existing utilities and the planned location of facilities to be constructed under the Contract, submit detailed information to the Owner's Inspector and Engineer for review and direction.

F. Maintain all existing utility mains and service lines in constant service during construction of the Work.

G. Where service disruptions are allowed, minimize the length of such disruptions by proper scheduling and diligent pursuit of the work.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Fill Type S1, S2, S4 and S5, as specified in Division 31 Specification Section SOIL MATERIALS.

2.2 WARNING TAPE

A. 6" wide warning tape shall be installed over all of the pipelines as shown on the details.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect plant life, lawns, trees, shrubs, and other features not authorized for removal.

B. Protect existing structures, fences, sidewalks, curbs, and other improvements from excavation equipment and vehicular traffic.

C. Maintain and protect above and below grade utilities which are to remain.

D. Comply with all provisions of the Construction Safety Orders and General Safety Orders of the California Division of Industrial Safety, as well as all other applicable regulations as they pertain to the protection of workers from the hazard of caving ground in excavations.

3.2 EXCAVATION

A. Excavate soil required to locate existing utilities and install the work.

B. Use hand methods of excavation to locate existing utilities, and to excavate trenches, pits and holes in congested areas.

C. Employ equipment and methods appropriate to the work site. Small mechanical excavators may be used only in areas where there is sufficient space so as not to damage adjacent improvements, and where the locations of all existing utilities have been determined by hand methods of excavating.

D. Cut trenches just wide enough to enable installation and proper bedding and backfill, and to allow inspection.

E. Do not interfere with 45 degree bearing splay of foundations.

F. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose material.

G. Excavate trenches, pits or holes bottoming in hardpan to a minimum of 6 inches below the grade for the bottom of the pipe and any couplings, and then backfill to the pipe grade with Type S2, S4 or S5 material, thoroughly compacted. No additional payment will be made for such over-excavation and refill.

H. In all trenches or excavation sites where a firm foundation is not encountered, such as soft, spongy, or otherwise unsuitable material, remove the material to a minimum of 12 inches, or to a depth determined by the Engineer, below the bottom of the proposed pipe or structure, and backfill the space with Type S2, S4 or S5 material containing sufficient moisture to allow compaction to 90% relative compaction. No additional payment will be made for such additional excavation or backfill.

I. Excavate trenches to provide the design grade of the facility, or as directed by the Engineer.

J. Stockpile excavated material to be returned to trench adjacent thereto in location which will not be detrimental to existing improvements, or pedestrian or vehicular traffic. Remove from site all unsuitable or excess material not to be used.

K. When excavating through tree roots, perform work by hand and cut roots, where authorized, with a saw.

L. Remove excess soil not used as backfill from the work site. Obtain a disposal site off of the Owner's property and legally dispose of said excess material, all at no additional cost to the Owner.

M. If water is encountered during excavations, provide all dewatering measures necessary to construct improvements shown.

N. Contractor shall make all provisions necessary, including but not limited to, shoring or sloping back trench walls as required to address sandy soils. The cost of these provisions shall be included in the lump sum amount bid for this work and no separate payment will be made therefore.

3.3 PROTECTION OF EXCAVATIONS

A. Provide all shoring and bracing as required and those codified in local, state and federal safety regulations.

B. Prevent water, caving or sloughing ground from entering excavations.

C. Maintain excavations free of water.

3.4 BACKFILLING

A. Provide type S2 or S5 pipe bedding as required by Plans and compact to 90% of the maximum dry density.

B. After installation of pipes and appurtenances and placement of pipe bedding material, backfill trenches and excavations to finished grade, or subgrade in areas to receive surface improvements

C. Backfill trenches above pipe bedding material and to within 24 inches of finish subgrade with Type S1, S2, S4 or S5 soils, except that that top 12 inches shall be type S2, S3, S4 or S5 soils.

D. Employ a placement method that does not disturb or damage existing or proposed pipes or other Utilities or Improvements.

E. Place and compact all soil backfill in continuous layers not exceeding 8 inches in uncompacted thickness.

F. Moisture condition backfill to within 2 percent of the optimum moisture content prior to compacting.

G. Backfill final 12-inch thickness to finish subgrade in areas to receive concrete, asphalt-concrete, aggregate base, or other non-vegetative surface improvement, with Type S2, S4 or S5 soils.

H. Backfill final 12-inch thickness to finish subgrade in areas to receive sod, other vegetation, or bare soil, with Type S2 or S3 soils.

I. Compact backfill below the top 12-inches to 90% of the maximum dry density.

J. In areas to receive buildings, structures, or concrete flatwork, compact the top 12-inches to 95% of the maximum dry density.

K. In areas to receive asphalt concrete pavements, compact the top 12-inches to 95% of the maximum dry density.

L. In planting areas, compact the top 12-inches to 85% of the maximum dry density.

3.5 TOLERANCES

A. Top Surface of Backfill under Paved or Concrete Areas: Plus or minus 0.02 feet from required elevations.

B. Top Surface of General Backfilling: As required for finish surface to match adjacent improvements or ground.

3.6 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of General Conditions and/or Division 01.

B. Compaction testing will be performed in accordance with ANSI/ASTM D1557.

C. If tests indicate work does not meet specified requirements, recompact, and retest. Retests required due to failure of initial tests shall be paid for by the Contractor.

3.7 PROGRESS AND PROSECUTION

A. Backfill any excavation opened in any day on that same day.

END OF SECTION

SECTION 313116
TERMITE CONTROL

PART 1 - GENERAL

1.1 REQUIRED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes soil treatment with termiticide.

1. Extent of application indicated in Part 3 Article “AREA OF APPLICATION.”

1.3 SUBMITTALS

A. Product Data: For termiticide. Include EPA-Registered Label for termiticide products.

B. Qualification Data: For Installer of termite control products.

C. Product Certificates: For termite control products, signed by product manufacturer.

D. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Termiticide brand name and manufacturer.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes, and rates of application.
6. Areas of application.
7. Water source for application.

E. Sample Warranty: For special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination" to schedule application of termiticide products.

1.5 FIELD CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

B. Related Work: Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.6 WARRANTY

A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain termite control products from a single source from a single manufacturer.

2.2 SOIL TREATMENT

A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Corporation, Agricultural Products; Termidor.
b. Bayer Environmental Science; Premise 75.
c. FMC Corporation, Agricultural Products Group; Dragnet SFR.

2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five (5) years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare work areas according to the requirements of authorities having jurisdiction and according to manufacturer's written instructions before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLYING SOIL TREATMENT

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

B. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.

1. Slabs-on-Grade: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
2. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating the slab, and around interior column footers, and piers; also along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.

3. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

C. Post warning signs in areas of application.

D. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.4 PROTECTION

A. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

B. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

END OF SECTION

SECTION 320190
EXISTING LANDSCAPE PROTECTION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This Section includes but is not limited to the following:
   1. Protection and maintenance of existing trees and other plants that are affected by the execution of the Work, whether temporary or new construction.

B. Related Work Specified Elsewhere
   1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections.
   2. Section 31 11 00: Site Clearing
   3. Section 31 20 00: Earthwork
   4. Section 32 84 00: Irrigation System
   5. Section 32 90 00: Landscape Planting

1.2 SUBMITTALS

A. Product Data: For each type of product indicated or proposed for use.

B. Qualification Data: Submit arborist's certification and/or license information. Submit qualifications and experience of the certified tree worker if not the arborist.

C. Project Certification: Provide a certification letter from the consulting arborist that trees indicated to remain have been protected during construction according to these specifications and/or the arborist's recommendations, and provide a list of any trees damaged during construction and the subsequent treatment and repair.

D. Transplanting and Maintenance Recommendations: Submit transplanting, maintenance and protection specifications from a qualified arborist for care and protection of trees during and after completion of the Work that are likely to be affected by construction operations. The tree maintenance recommendations shall be included in the Maintenance Manuals required in 329000.

E. Tree Assessment and Valuation: Prior to the start of any construction operations of any kind, submit a tree assessment including tree valuation for existing trees scheduled to remain in the area of work or in auxiliary construction areas.
   1. Tree valuation for trees species that do not have comparable and available replacement sizes shall be determined by a certified consulting arborist experienced in tree valuation using the "Guide for Establishing Values of Trees and Other Plants", current edition, published by the International Society of Arboriculture, Urbana, Illinois.

2. Tree assessment shall include a physical description, health, condition and recommended pruning and/or mitigation measures based on the expected construction operations to minimize the negative impacts to the affected trees.

1.3 QUALITY ASSURANCE

A. Tree Service Qualifications: An experienced tree service firm that has successfully completed tree protection and/or relocation work similar to that required for this Project, and who will provide experienced, certified tree workers.

B. Arborist Qualifications: The arborist shall be certified by the International Society of Arboriculture. If the arborist is performing tree work, he/she shall be employed by a licensed contractor, or shall hold an individual license if independent.

C. Tree Pruning Standards: Comply with ANSI A300, "Trees, Shrubs, and Other Woody Plant Maintenance--Standard Practices," unless more stringent requirements are indicated or recommended by the certified arborist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Drainage Fill: Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D 448, Size 24, with 90 to 100 percent passing a 2-1/2-inch sieve and not more than 10 percent passing a 3/4-inch sieve.

B. Topsoil: See Section 32 90 00.

C. Filter Fabric: Manufacturer's standard, nonwoven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers, minimum 4.8 oz/sq. yd.

D. Temporary Fencing: Heavy-duty exterior rated plastic or chain link fencing, minimum four feet high with stakes at a maximum 10 feet on-center or as needed for a taut installation.

E. Wood mulch: Walk-on type chipped wood and aged greenwaste material without leaves, green wood, sticks, dirt, dust, construction materials and other debris. Particle size 1/2” to 3" in general size.

F. Coarse sand: Clean sand with greater than 95% passing a #10 seive, less than 5% passing a #30 seive, and less than 1% passing a #50 seive.

2.2 TEMPORARY TPZ FENCING TYPES

A. TPZ 1: Temporary fencing shall be installed at the drip line of the tree canopy. Where the canopy extends into remaining or proposed hardscaped areas, the posts may be supported by appropriate on-grade concrete or weighted bases.

B. TPZ 2: Where existing trees are in planting strips with active walkways and/or roadways in the TPZ, the temporary fencing shall extend to the edge of the hardscaped areas to keep the walkways and/or roadways open.

C. TPZ 3: Existing trees remaining in small planters or tree wells shall be wrapped with a minimum 2 inch thickness of orange plastic construction fencing from the ground to the first scaffold branch, or 4 feet high, whichever is greater. The wrapped section shall be covered with vertical 1.5 inch square slats and bound around the trunk firmly at least every 2 feet. Use caution when installing the slats so that the tree bark is not damaged.

PART 3 - EXECUTION

3.1 PREPARATION

A. Temporary Fencing: Install temporary fencing located around the canopy drip line of trees (the tree protection zone [TPZ]), and around the plants scheduled to remain that are inside the construction area. The TPZ fence layout shall be reviewed for acceptance by the Owners Representative and the consulting arborist.

B. All work within the TPZ shall be reviewed and monitored by the consulting arborist.

C. Within the TPZ, install a 4 inch depth of wood mulch over a permeable filter fabric with minimum 4 inch overlaps at fabric seams. Remove the protection mulch and fabric prior to any cultivation and amendment tillage.

D. Provide a temporary dirt berm watering basin around trees and plants scheduled to remain. The berm around trees shall be a minimum diameter of six times (6x) the diameter of the tree at breast height (DBH), or not less than six feet in diameter, whichever is greater.

E. Provide temporary irrigation or a portable water source to irrigate trees and plants scheduled to remain. Irrigate at minimum once a week or more often as necessary to moisten soil to a minimum 18 inch depth for trees, and a minimum depth of 12 inches for shrubs. Reapply irrigation based on an evapotranspiration loss of 50%.

F. Protect plant/tree root systems within the protected fenced areas from damage due to noxious materials caused by runoff or spillage while mixing, placing, or storing construction materials. Protect root systems from flooding, eroding, or excessive wetting caused by dewatering operations.

G. Do not store construction materials, debris, or excavated material within the TPZ. Do not permit vehicles or reoccuring foot traffic within the TPZ to prevent soil compaction over root systems.

H. Do not allow fires under or adjacent to remaining trees or other plants.

3.2 EXCAVATION

A. Do not excavate within the canopy drip line of existing trees unless otherwise authorized. Any excavation within the TPZ shall be performed under the onsite monitoring by the consulting arborist.

B. Where excavation for new construction and/or utility lines are required within the canopy drip line of trees, hand clear and excavate to minimize damage to root systems. Use spading forks to comb soil or use an Air-Spade to expose roots.

C. Where utility lines are to be located within the drip line of trees, expose the existing root system to the depth of utility line installation plus the depth of any required bedding material. Place piping below and/or through the exposed roots without damage to the root system. Backfill with approved material and compact by flooding the area if allowed.

D. As an alternative to manual or Air-Spade trench excavation, utility or other below grade piping may be mechanically bored under the crown dripline with a minimum cover of 3 feet as authorized by the consulting arborist.

E. Root Pruning: Do not cut main lateral roots or taproots greater than one inch in diameter. Smaller roots less than one inch in diameter that interferes with the installation of new improvements and/or utility lines may be cut only if absolutely necessary. Only cut roots with sharp pruning instruments; do not break, tear or chop. Block out concrete footings around roots greater than one inch diameter leaving a minimum one inch clearance around roots to remain. Provide alternative footing design if main lateral roots are in conflict.

3.3 REGRADING

A. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by the certified arborist, unless otherwise indicated.
   1. Root Pruning: Prune tree roots exposed during grade lowering. Do not cut main lateral roots or taproots; cut only smaller roots less than one inch diameter. Cut roots with sharp pruning instruments; do not break or chop.

B. Minor Fill: Where existing grade is 12 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations. Do not place fill greater than 6 inches in depth within 24 inches of the trunk, and do not cover the trunk/root base flare. Do not allow standing water at the trunk.

C. Moderate Fill: Where existing grade is more than 12 inches, but less than 18 inches below elevation of finish grade, place drainage fill, filter fabric, and topsoil on existing grade as follows:
   1. Carefully place drainage fill against tree trunk approximately 2 inches above elevation of existing grade and extend not less than 20 inches from tree trunk on all sides up to the finish grade. Slope of the rock fill shall be a maximum 2h:1v. For balance of area within drip-line perimeter, place drainage fill a minimum 6 inches in depth.
   2. Place filter fabric over the drainage fill with edges overlapping 6 inches minimum.
   3. Place fill layer of topsoil to finish grade. Do not mechanically compact drainage fill or topsoil more than 85% relative density in planted areas. Hand grade to required finish elevations.

3.4 TREE PRUNING

A. Prune remaining trees affected by temporary and new construction only when authorized by the Landscape Architect and as recommended by the consulting arborist.

B. Prune remaining trees to compensate for root loss caused by damaging or cutting root system only when authorized by the Landscape Architect and as recommended by the consulting arborist. Provide subsequent maintenance during Contract period as recommended by the consulting arborist.

C. Pruning Standards: Prune trees according to ANSI A300 based on pruning for access clearance, to correct any defects in structure, or to remove potential conflicts with new improvements. Pruning shall only be performed by a Certified arborist or tree worker.

D. Cut branches with sharp pruning instruments; do not break or chop. Clean pruning tools with a diluted bleach solution prior to performing any pruning operations.

3.5 TREE REPAIR AND REPLACEMENT

A. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to written instructions of the arborist.

B. Remove and replace dead and/or damaged trees impacted by the construction operations that the arborist determines to be incapable of restoring to a normal growth pattern.
   1. Provide new trees of the same size and species as those being replaced; plant and maintain as specified in 32 90 00.
   2. When new trees of the same size and species are not available, furnish and install the largest size boxed tree that is readily available and will successfully grow in the planting area with long term health and without damage to adjacent improvements. Credit the Owner the difference

between the valuation of the removed existing tree and the installed replacement tree.

C. Aerate surface soil within any existing Oak tree dripline compacted before or during construction, 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch- diameter holes a minimum of 18 inches deep at 36 inches o.c. Backfill holes with coarse sand. Manually till the top 4 inches with a spading fork, and break up clods greater than 1 inch diameter. Smooth grade prior to installing wood mulch.

3.6 CLEAN-UP

A. Burning is not permitted.

B. Prior to Final Acceptance, remove the TPZ fence, stakes and other related materials.

C. Legally remove excess excavated material, debris, displaced trees, and greenwaste from Owner's property. Broom clean all hardscape surfaces in the area of work.

END OF SECTION

SECTION 321126
AGGREGATE BASE COURSE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY:

A. This Section includes the following:

1. Provide all material, labor, equipment and services necessary to install aggregate base surfacing as indicated by the Contract Documents.

B. RELATED SECTIONS

1. Contract General Conditions and Division 1, General Requirements
2. Section 31 11 00 – Site Clearing
3. Section 31 20 00 – Earthwork: Excavation, Filling, and Grading.
4. Section 32 12 16 – Soil Sterilization.
5. Section 31 22 22 – Soil Materials

1.3 REFERENCES

A. SSCDOT - Standard Specifications, Department of Transportation, State of California (Caltrans), latest edition, except for references to method of payment, and references to any state furnished materials.

1.4 QUALITY ASSURANCE

A. Provide and install in accordance with SSCDOT.

1.5 SUBMITTALS

A. Submit data sheets from supplier to document compliance with SSCDOT requirements.

B. Certificates of compliance for material.

C. Load tags for delivered material.

1.6 COORDINATION

A. Coordinate with other work, including subgrade preparation and soil sterilization.

B. Coordinate installation schedule with Owner's use of the premises and with other contractors working at the site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aggregate Base: Unless specified otherwise on Plans, Class 2, 3/4 Inch Maximum per Section 26 of SSCDOT.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify quantities required.

B. Verify that subgrade has been placed and compacted per Contract Documents

C. Verify gradients and elevations of subgrade are correct.

3.2 INSTALLATION OF AGGREGATE BASE COURSE

A. Install in conformance with SSCDOT Section 26, Aggregate Bases.

B. Thickness - As shown on construction drawings.

C. Spreading and Compacting - In accordance with Section 26, SSCDOT. The relative compaction of each layer of compacted base material shall be not less than 95 percent.

D. The completed surface shall be thoroughly compacted, free from ruts, depressions, and irregularities, true to grade and cross-section.

E. Lines and grades for the installation of aggregate base shall be set by a California licensed Land Surveyor or Civil Engineer, at Contractor's expense.

3.3 TOLERANCES

A. Compacted thickness of aggregate base: Not less than the thickness specified on the Plans.

B. Finished Surface: Within 0.02 foot of planned grade per Section 26, SSCDOT. No more than 50% of the finish surface shall be above or below the specified grade for aggregate base.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed by the Owner's inspector, under provisions of Division 01.

3.5 PROTECTION

A. Immediately after placement and compaction, protect surface from mechanical injury.

B. Protect completed surface until surfacing layers are in place.

END OF SECTION

SECTION 32 11 30
SYNTHETIC TURF

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Synthetic turf playground surfacing system.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
   2. ASTM D624 Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
   3. ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.
   4. ASTM D2859 Standard Test Method for Flammability of Finished Textile Floor Covering Materials.
   5. ASTM E303 Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.
   6. ASTM F1292 Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment.
   7. ASTM F1951 Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements: Provide a 2-layer (bottom layer rubber-polyurethane/top layer synthetic grass (with or without rubber infill) playground surfacing system that has been designed, manufactured and installed to meet the following criteria:
   1. Shock Attenuation (ASTM F1292):
   2. Gmax: Less than 200.
   3. Head Injury Criteria: Less than 1000.
   4. Flammability (ASTM D2859): Pass.
   5. Tensile Strength (ASTM D412): 60 psi (413 kPa).
   6. Tear Resistance (ASTM D624): 140%.
   7. Water Permeability: 0.4 gal/yd2/second.
   8. Accessibility: Comply with requirements of ASTM F1951.

1.4 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit manufacturer's product data and installation instructions.
   1. Verification Samples: Submit manufacturer's standard verification samples of 6" x 6" minimum.

C. Quality Assurance/Control Submittals: Submit the following:
   1. Certificate of qualifications of the playground surfacing installer

D. Closeout Submittals: Submit the following:
   1. Warranty documents specified herein.

1.5 QUALITY ASSURANCE

A. Qualifications: Utilize an installer approved and trained by the manufacturer of the playground surfacing system, having experience with other projects of the scope and scale of the work described in this section.

B. Certifications: Certification by manufacturer that installer is an approved applicator of the playground surfacing system.

1.6 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirement Section.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at a minimum temperature of 40 degrees F (4 degrees C) and a maximum temperature of 90 degrees F (32 degrees C).

1.7 PROJECT/SITE CONDITIONS

A. A. Environmental Requirements: Install surfacing system when minimum ambient temperature is 40 degrees F (1 degree C) and maximum ambient temperature is 90 degrees F (32 degrees C). Do not install in steady or heavy rain.

1.8 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents.

B. Warranty Period: Five (5) years from date of completion of work.

PART 2 - PRODUCTS

2.1 SPECTRATURF PLAYTURF PLAYGROUND SURFACING SYSTEM

A. Manufacturer: SpectraTurf
   1. Contact: 555 South Promenade Avenue #103, Corona, CA 92879; Telephone: (951) 736-3579; Fax: (951) 734-3630;
   2. E-mail: info@spectraturf.com; website: http://www.spectraturf.com.

B. SpectraTurf PlayGrass playground surfacing system, including the following:
   1. SpectraTurf Primer:
      a. Material: Polyurethane.
   2. SpectraTurf PlayTurf Basemat:
      a. Material: Blend of 100% recycled SBR (styrene butadiene rubber) and polyurethane.
      b. Thickness: 2 1/2”
   3. SpectraTurf PlayGrass:
      a. The synthetic turf material and (optional) resilient infill shall be in accordance with the following:
      b. The fiber shall be low friction fiber, measuring not less than 1-1/4” high. The low friction fiber shall be specifically designed to virtually eliminate abrasion.
      c. The fiber shall be tufted on a 3/8" tufting machine at a rate of 3 stitches per inch minimum. The low friction non-abrasive fiber shall be treated with a UV inhibitor.
      d. The primary backing shall consist of a one part, two or three component polyester/polypropylene backing with a minimum weight of 7 ounces per square yard. The secondary backing shall consist of an application of polyurethane (minimum of 20 ounces per square yard); heat activated to permanently lock fiber tufts in place. Products using latex based secondary backings will not be acceptable. The synthetic grass system shall be perforated with 3/16" holes every four (4") inches in both directions to provide for maximum drainage. Complete synthetic grass system (including base pad) shall drain in excess of 15" per hour. Non-perforated systems shall not be acceptable alternates for purposes of this specification.
      e. The carpet shall be delivered in 15’ wide rolls by lengths best suited for the project.
      f. The fiber shall be field green in color to simulate natural grass as closely as possible and treated with UV inhibitor, guaranteed a minimum of five years.
      g. If infill is included in system, it shall consist of a non-compacting mixture of ambiently recycled SBR or EPDM crumb rubber, black in color, 1-4 mm in size. The rubber shall be applied at approximately 3 pounds per square foot. Sand infill also available.

PART 3 - EXECUTION

3.1 GENERAL

A. Comply with the instructions and recommendations of the playground surfacing manufacturer.

3.2 EXAMINATION

A. Site Verification of Conditions: Verify that substrate conditions are suitable for installation of the playground surfacing system. New asphalt must be fully cured – up to 30 days. New concrete must be fully cured – up to 7 days.

B. Do not proceed with installation until unsuitable conditions are corrected.

3.3 INSTALLATION

A. Do not proceed with playground surfacing installation until all applicable site work, including substrate preparation, fencing, playground equipment installation and other relevant work, has been completed.

B. Basemat Installation:
   1. Using screeds and hand trowels, install the basemat at a consistent density of 29 pounds, 10 ounces per cubic foot (466 kg/m3) to the specified thickness.
   2. Allow basemat to cure for sufficient time so that indentations are not left in the basemat from applicator foot traffic or equipment.
   3. Do not allow foot traffic or use of the basemat surface until it is sufficiently cured.

C. PlayTurf installation:
   1. Rough cut synthetic grass rolls for installation.
   2. Using 15" wide cordura seam tape and 1-part urethane adhesive, seam synthetic grass rolls to form monolithic surface. Adhere synthetic grass to basemat around playground perimeter.
   3. If infill is included in system, using manual or machine-operated spreading equipment, distribute rubber infill throughout synthetic grass installation to within 1/4" to 1/2" of fiber tip. (3 pounds per square foot).

3.4 PROTECTION

A. Protect the installed playground surface from damage resulting from subsequent construction activity on the site.

END OF SECTION

SECTION 32 12 16
SOIL STERILIZATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to the work specified in this section.

1.2 SUMMARY

A. This section includes the following: Furnishing and installing soil sterilant under all new crushed stone surfacing (decomposed granite and rock dust).

B. RELATED SECTIONS

1. Section 31 20 00 - Earthwork: Excavation, Filling, and Grading

2. Section 32 11 26 – Aggregate Base Course

3. Section 32 12 17 – Asphalt Paving

4. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications sections, apply to the work of this section.

1.3 STANDARDS

A. In accordance with the following:

CCR-T21	California Code of Regulations, Title 21 Public Works.
CBC	California Building Code, California Code of Regulations, Title 24, Part 2, CCR-T24.
USDA	United States Department of Agriculture.
EPA	Environmental Protection Agency.
CM	City of Merced

All applicable Environmental Regulations and Standards.

1.4 QUALITY ASSURANCE

A. Provide licensed operator to apply soil sterilant.

B. All products shall comply with the current EPA laws at time of application. Should the products listed become unavailable because of changes in the law, submit substitute products for review by the Owner.

1.5 SUBMITTALS

A. Submit in accordance with Specification Section SUBMITTAL PROCEDURES.

B. Certificates of application.

C. Certificates of compliance for material.

1.6 COORDINATION

A. Coordinate with other work, including subgrade preparation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Soil Sterilant: Bayer Oust XP, weed and grass preventer, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that site is ready for application.

3.2 PREPARATION

A. Identify installation locations.

B. Employ equipment and methods appropriate to the work site.

C. Provide vehicular and traffic controls per Specification Section TEMPORARY FACILITIES AND CONTROLS.

3.3 APPLICATION

A. Thoroughly water soak surface to be treated. Avoid excessive water runoff.

B. Apply sterilant solution over surface to receive pavement or surfacing prior to the start of pavement or surfacing installation.

C. Apply in spray form, at rate as allowable by State of California.

D. Take all precautions to limit soil sterilant solution to areas immediately under proposed pavement or surfacing. Use shields as necessary, and do not apply under windy conditions.

3.4 FIELD QUALITY CONTROL

A. Field inspection will be performed under Specification Section QUALITY REQUIREMENTS.

END OF SECTION

SECTION 32 12 17
ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Provide all material, labor, equipment and services necessary to completely install all pavement materials, accessories and other related items as required by the Contract Documents.

1.3 RELATED SECTIONS:

A. All Division 00 Specification Sections

B. All Division 01 Specification Sections

C. Section 31 22 00 - Earthwork: Excavation, Filling, and Grading

D. Section 31 23 33 - Trench Excavation and Backfill

E. Section 32 11 26 - Aggregate Base Course.

F. Section 32 12 16 - Soil Sterilization.

1.4 REFERENCES

A. SSCDOT - Standard Specifications, Department of Transportation, State of California (Caltrans), latest edition, except for references to method of payment, and references to any state furnished materials.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with SSCDOT.

B. Mixing Plant: Conform to SSCDOT.

C. Installation Criteria: Asphalt concrete shall show no evidence of cracking, uneven settlement, improper drainage, or untoward junctions with adjoining or existing

surfaces. Work displaying such conditions shall be corrected under the Contractor's guarantee of all work.

1.6 SUBMITTALS

A. Submit under provisions of Division 01.

B. Mix design

C. Certificates of compliance for material.

D. Load tags for delivered material.

1.7 COORDINATION

A. Coordinate with other work, including subgrade preparation, aggregate base placement and soil sterilization.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt-concrete when atmosphere temperature is less than 50 degrees F, or surface is wet or frozen.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paint Binder: In accordance with SSCDOT Section 94, Asphaltic Emulsions.

B. Asphalt-Concrete: Type B in accordance with Section 39, SSCDOT, ½ inch maximum aggregate (medium) as indicated on the Plans. The asphaltic concrete shall be compacted to an average relative compaction of 97 percent, with no single test value being below a relative compaction of 95 percent based on a 50 blow Marshall maximum density. Use asphalt binder performance grade PG 64-10.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify quantities required. New asphalt-concrete paving is required at all locations shown on the plans, and where existing asphalt-concrete paving to remain is removed or damaged by the Project excavation or related work.
B. Verify that subgrade or base material has been compacted to required relative compaction and is dry.
C. Verify gradients and elevations of base are correct.

D. Verify that subgrade or base material has been sterilized per Section 31 31 00 SOIL STERILIZATION.

3.2 AGGREGATE BASE

A. Where shown on the construction plans, place and compact aggregate base course per Section 32 11 26 AGGREGATE BASE COURSE.

B. Where shown on the construction plans, place asphalt on compacted earth subgrade per Section 31 20 00 EARTHWORK: EXCAVATION, FILLING AND GRADING and Section 31 23 00 TRENCH EXCAVATION AND BACKFILL.

C. A soil sterilant shall be applied over the entire area which is to be paved in accordance with Section 31 12 16 SOIL STERILIZATION

3.3 PREPARATION – PAINT BINDER

A. Apply paint binder to existing asphalt-concrete or concrete surfaces which will be in contact with asphalt-concrete surfacing.

B. Rate of application for all surfaces against which asphalt concrete is to be placed shall be no less than 0.02 and no more than 0.05 gallons per square yard. All vertical concrete surfaces which will be in contact with asphalt concrete surfacing and all areas now in place which will be covered with new surfacing materials and feathering operations shall be coated with a paint binder applied at the rate of 0.05 gallons per square yard.

3.4 INSTALLATION OF ASPHALTIC-CONCRETE

A. Install in conformance with SSCDOT Section 39, Asphalt-Concrete.

B. Thickness - As shown on construction plans. Where thickness exceeds 3 inches, place in no less than 2 layers. Asphaltic concrete shall be laid to the thickness designated on the Plans. The plan thickness is to be considered as a minimum thickness. The Contractor shall lay the asphaltic concrete to a depth required to insure that, after compaction, the in place compacted thickness is equal to or greater than the specified plan thickness.

C. The Contractor shall provide to the Engineer the truck delivery weight tags for the asphaltic concrete material. The quantity delivered shall be equal to or greater than the calculated in place quantity based on the specified thickness and area to be paved as designated on the construction plans and based on a unit density of the asphaltic concrete of 141 pounds per cubic feet.

D. Asphalt type: PG 64-10

E. Compaction Equipment - In accordance with Section 39, SSCDOT. At small difficult areas, equipment may be altered as approved by Engineer.

F. The completed surface shall be thoroughly compacted, free from ruts, depressions, and irregularities and to be true to grade and cross-section.

3.5 TOLERANCES –GENERAL

A. Finished Surface: within 0.02 foot of planned grade.

B. Flatness: Maximum variation of 1/4 inch measured with 10-foot straight edge.

C. Scheduled Compacted Thickness: Not less than specified.

D. Finished Surface adjacent to concrete gutters, mowstrips, and flatwork shall be slightly above the adjacent concrete (0” to 1/8” above adjacent concrete) to prevent damage from asphalt rollers

3.6 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 01.

B. Pavement shall comply with the following:

1. Water shall not be able to accumulate at any point and the surface shall be free to drain to drainage inlets or gutters.
2. The paving contractor shall water flood the surface with the use of a water truck. If, after 30 minutes on a 70 degree F day, “bird baths” are evident in a depth more than 0.01 foot, the paving contractor and the Owner’s representative will determine the best method of correction.
3. A 10 foot straightedge shall be used to check for high spots and ridges. High spots and ridges out of compliance shall be reduced by a remedy determined by the paving contractor and the Owner’s representative.

C. Should a section of the work be not acceptable on the basis of inadequate compaction and/or the mixture becomes loose and broken, mixed with dirt, out of tolerance, or in any other way defective, it shall be repaired or removed and replaced with fresh mixture and immediately compacted to conform to the surrounding area to the satisfaction of the Owner.

3.7 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury.

B. Protect sealed surface until it is cured.

END OF SECTION

SECTION 321313
SITE CONCRETE IMPROVEMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY:

A. This Section includes the following:
   1. All material, labor, equipment and services necessary to completely install exterior Portland cement flatwork, cast-in-place concrete, and architectural flatwork concrete, accessories and other related items, slabs, ramps and sidewalks and walkways, curb and gutter, mowstrips, and other miscellaneous concrete items of the form and dimensions shown on the plans and necessary to complete the project, and in accordance with the requirements of the Standard Specifications as modified and supplemented by these Special Provisions
   2. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications sections, apply to the work of this section.

B. RELATED SECTIONS:
   1. Section 31 20 00 - Earthwork: Excavation, Filling, and Grading
   2. Section 32 11 26 - Aggregate Base Course.
   3. Section 32 13 15 - Concrete Reinforcement

1.3 REFERENCES

A. SSCDOT - Standard Specifications, Department of Transportation, State of California (Caltrans), latest edition, except for references to method of payment, and references to any state furnished materials.

B. ACI standards, including but not limited to #304, 305, 306, 308, 309 and 347.

C. ASTM standards, including but not limited to #C-33, C-39, C-94, C-136, C-143, C-150, and C-309.

1.4 SUBMITTALS

A. Submit under provisions of Specification Section SUBMITTALS.
   1. Certificates of compliance for materials and mix designs.
   2. Load tags for delivered material.
   3. Strength testing as required by the approving agency.
   4. Integral color sample, where applicable.
   5. Application instructions for the architectural finish materials.

6. Accessories and manufacturer's installation specifications.

1.5 QUALITY ASSURANCE

A. Furnish concrete materials conforming with SSCDOT.

B. Perform work in accordance with SSCDOT, unless noted otherwise herein.

PART 2 - PRODUCTS

2.1 MIXES

A. Mix Design and Proportions in accordance with SSCDOT:
   1. Mix designs with Fly Ash content no greater than 15 percent of the total weight of cementitious materials shall be proportioned by SSCDOT.
   2. Provide a maximum of 4 percent air entrainment, unless noted otherwise.
   3. Owners Testing laboratory shall review all mix designs before submittal.
   4. All concrete shall have the following minimum compressive strengths in accordance with ACI 318 and SSCDOT at 28 days and shall be proportioned within the following limits:
      a. Site Concrete: Use for exterior concrete slabs on grade including, but not limited to sidewalks, curbs, gutters, mow strips, utility appurtenances and miscellaneous site improvements.
         1) Strength: 3,000 psi at 28 days
         2) Maximum Aggregate Size: 1-inch
         3) Cement Type: Type I
         4) Cement Content: 5.5 sacks/yd minimum
         5) Max Water/Cement Ratio: Per SSCDOT
         6) Admixture Per SSCDOT
      b. Structures & Vehicular Concrete Paving: Use for site structures and exterior slabs on grade subject to vehicle traffic.
         1) Strength: 4,000 psi at 28 days
         2) Maximum Aggregate Size: 1-inch
         3) Cement Type: Type I
         4) Cement Content: 6.5 sacks/yd minimum
         5) Max Water/Cement Ratio: Per SSCDOT
         6) Admixture: Per SSCDOT
      c. Slurry Backfill: Use for backfill of over-excavated trenches, encasement of all penetration, and site utility piping.
         1) Maximum Aggregate Size: 3/8-inch
         2) Cement Type: Type I
         3) Cement Content: 2.0 sacks/yd minimum

B. Reinforcement shall comply with relevant portions of Division 32 Specification Section CONCRETE REINFORCEMENT.

PART 3 - EXECUTION

3.1 PREPARATION

A. Subgrade shall conform to the requirements of Division 31 Specification Section EARTHWORK: EXCAVATION, FILLING AND GRADING. The District may elect to verify compacted subgrade elevations by measurement made from adjacent existing improvements or by a template supported by forms.

3.2 GENERAL CONCRETE

A. Concrete placement shall conform to the applicable requirements of Standard Specification Sections 51 and 90. Concrete shall not be placed when the air temperature in the shade at the project site exceeds 95º F or is below 45º F, or when the temperature of the concrete exceeds 85º F.

B. After the concrete has been placed, it shall be struck off to proper section and compacted with a grid of parallel metal bars until a layer of mortar not less than 3/8 inch thick has been brought to the surface. All exposed concrete surfaces shall receive a medium broom finish applied transversely to the line of pedestrian traffic or to the longest dimension of the concrete, as applicable.

C. General concrete surfaces shall be cured by the curing compound method and shall be protected in accordance with the provisions of Subsections 90-1 and 90-2 of the Standard Specifications.

3.3 PROTECTION OF CONCRETE

A. The Contractor shall be responsible for the condition of all concrete work until such time as all work has been completed and is accepted by the District. The Contractor shall limit vehicular travel across concrete until such time as the concrete has achieved strength sufficient that it can support traffic without damage. In no case, however, will vehicles be allowed to travel across new concrete improvements until seven calendar days have passed since the concrete was placed.

3.4 CONCRETE JOINTS

A. Expansion joints and weakened plane joints shall be constructed at the locations shown on the plans or as directed by the Engineer. Where joint locations are not specified on the plans, expansion joints shall be constructed at maximum intervals of 30 feet, and weakened plane joints shall be constructed at maximum intervals of 10 feet.

B. Expansion joints shall be considered as weakened plane joints for the purpose of spacing weakened plane joints. Expansion joints shall be tooled with a 1/4 inch maximum radius edger, and shall be filled with 3/8 inch pre-formed expansion joint filler.

3.5 CONCRETE FINISHES

A. Where concrete is being installed adjacent to or near existing concrete improvements, match the finish of similar concrete surfaces (i.e. new sidewalks shall match existing sidewalks, new curbs shall match existing curbs, etc.).

B. Sidewalks and Mowstrips: Medium sweat finish or medium broom finish perpendicular to the direction of travel.

C. Curbs: Trowel smooth and finish with a light brush.

D. Gutters: Medium broom finish parallel with curb or direction of flow.

E. Drive approaches and wheelchair ramps: medium broom finish, perpendicular to the direction of travel.

3.6 INSTALLATION OF ACCESSORIES

A. Strictly comply with manufacturer's instructions and recommendations and approved details. Securely anchor work to substrate.

3.7 REPAIR AND CLEAN-UP

A. Contractor shall legally remove all trash, debris, containers and excess materials from the site on a periodic basis, and shall keep the work broom clean until Owner’s acceptance.

B. The Contractor shall be held responsible for the repair and/or replacement of new or existing improvements damaged as a result of this work to the satisfaction of the Owner.

C. The Contractor shall provide roll-off bins for wash-out of ready mix concrete trucks and pumpers. Do not allow concrete debris or cement water onto soils scheduled for landscape planting.

END OF SECTION

SECTION 321315
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY:

A. This Section includes the following:
   1. Concrete reinforcement

B. RELATED SECTIONS
   1. Section 32 13 13 - Site Concrete Improvements.

1.3 SUBMITTALS

A. Submit in accordance with Specification Section SUBMITTALS and the Contract General Conditions.

   1. Mill test certificates identifying chemical and physical analysis of each load of reinforcing steel delivered. If mill test reports are not available and the quantity of steel for a structure exceeds 5 tons, provide a laboratory test to prove yield strength and bending.
   2. Drawings and placing diagrams for each grade slab including dowels and corner bars.
   3. On the placing diagrams, show all openings for pipelines and architectural features. Include additional reinforcing at openings and corner bar arrangements at intersecting beams, walls, and footings.
   4. Coordinate placing diagrams with the concrete placing schedule.

1.4 PRODUCT DELIVERY

A. Deliver reinforcement to project site in bundles marked with tags indicating bar size and length.

B. Store on wooden supports above ground surface.

PART 2 - PRODUCTS

2.1 BARS

A. Bars shall be deformed billet steel conforming to ASTM A 615, Grade 60. Mixing of steel grades will not be allowed.

2.2 BAR SUPPORTS

A. Bar support shall be concrete or metal chairs, spacers or hangers. Reinforcing bars shall not be supported by forms.

2.3 TIE WIRE

A. Tie wire shall be annealed steel wire of not less than 16-gauge.

PART 3 - EXECUTION

3.1 PLACEMENT

A. Position reinforcement in accordance with the drawings, secure with wire ties or suitable clips at all intersections, and support by an adequate number of concrete or metal chairs, spacers, or metal hangers such that reinforcing bars do not sag more than one quarter of an inch (1/4”) between supports. Do not place reinforcement or supports in contact with the forms. Bend tie wires away from the forms in order to provide the specified concrete coverage. To secure reinforcement in position, the Contractor may elect to locate bars additional to those shown on the drawings, but at no additional cost to the Owner.

B. Set reinforcing dowels and anchor bolts in place prior to placing concrete. Do not press them into the concrete after the concrete has been placed.

3.2 SPLICES

A. Splice bars only at locations shown on the drawings. Where splices are not detailed, lap bars 36 bar diameters and 18 inches minimum and stagger adjacent splices 48 bar diameters.

3.3 CLEANING

A. Remove dirt, form oil, excessive rust, cement coating from previous pours, and foreign matter that will reduce bond with concrete.

3.4 PROTECTION DURING CONCRETING

A. Keep reinforcing steel in proper position during concrete placement.

END OF SECTION

SECTION 321540
CRUSHED STONE SURFACING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish and install decomposed granite surfacing which includes:
   1. Sub-grade Preparation
   2. Base Preparation
   3. Edge restraint
   4. Stabilizer
   5. Compaction
   6. Cleanup

B. Related work:
   1. Section 312200 - Earthwork
   2. Section 312222 - Soil Materials
   3. Section 321216 - Soil Sterilization
   4. Section 321126 - Aggregate Base

C. Definitions: The word Architect as used herein shall refer to the Landscape Architect or the Owner's authorized representative.

1.2 SUBMITTALS:

A. Procedure: Submittals shall be provided in accordance with Division 1 requirements.

B. Submit aggregate sieve analysis, product specifications and a one pint representative sample of the proposed decomposed granite, with named source.

PART 2 - PRODUCTS

2.1 DECOMPOSED GRANITE

A. Decomposed granite is referred to by the abbreviation (D.G.), or referred to as disintegrated granite. All decomposed granite for non-vehicular surfaces shall conform to the following grading requirements:

Sieve Designation	% Passing
3/8 inch	100
No. 4	90-100
No. 8	75-80
No. 16	55-65

Sieve Designation	% Passing
No. 30	40-50
No. 50	25-35
No. 100	15-20
No. 200	10-15

B. All decomposed granite for vehicular surfaces shall conform to the following grading requirements:

Sieve Designation	% Passing
1/2 inch	95-100
3/8 inch	90-95
No. 4	65-80
No. 8	43-63
No. 16	40-49

Sieve Designation	% Passing
No. 30	30-40
No. 50	20-27
No. 100	10-18
No. 200	10-12

C. The portion of D.G retained on the no. 4 sieve shall have a maximum percentage of wear of 50 at 500 revolutions as determined by AASHTO T96.

D. The portion passing a No. 40 sieve shall have a maximum liquid limit of 25 and maximum plasticity index of 7 as determined by AASHTO T89 and AASHTO T90, respectively.

E. The sand equivalent shall be in the range of 35-55. The R-value shall be a minimum of 71.

F. Crushed aggregate screenings shall be free from clay lumps, vegetative matter and deleterious material.

G. D.G. shall be tan or grey in color.

2.2 SOIL BINDER

A. Binder shall be a non-toxic, colorless, odorless, organic powder that binds D.G. screenings consisting of 95% Psyllium with a minimum 70% Mucilliod content. The binder shall be “Stabilizer” as manufactured by Stabilizer Solutions Inc., (800) 336-2468, FAX: (602) 225-5902, or equal.

2.3 EDGING

A. Aluminum edging: 3/16” x 5 ½”, manufactured from 6063 extruded aluminum alloy of T-6 hardness with interlock system and 5 stake punch outs fabricated in each strip. Stakes 12” long, lock 1/2” below top of edging.
   1. Finish: Black anodized

PART 3 - EXECUTION

3.1 SUBGRADE AND DECOMPOSED GRANITE PREPARATION AND COMPACTION

A. Subgrade under all D.G. shall be scarified to a minimum depth of 12”, graded and compacted to 90% maximum dry density (relative compaction).

B. Aggregate base under D.G. surfacing shall be in conformance with Section.

C. After subgrade preparation or base installation, sterilize base or subgrade receiving D.G. surfacing per Specification Section SOIL STERLIZATION.

D. Minimum compaction for pedestrian use D.G. surfaces shall be 85% maximum dry density (relative compaction), and 90% maximum dry density (relative compaction) for vehicular use. The Contractor shall provide one compaction test for every 2,000 square feet or fraction thereof.

E. The finish grade shall be even between the headers with no humps or depressions greater than +/- 0.25" after the compaction.

3.2 SOIL STABILIZER AND DECOMPOSED GRANITE INSTALLATION

A. Soil stabilizer shall be thoroughly mechanically blended per the manufacturer's recommendations with the D.G. screenings prior to transport to the job site.
   1. For vehicular and/or pedestrian use, the stabilizer shall be mixed at a minimum rate of 15 lbs. of Stabilizer product per ton of D.G. aggregate.
   2. For tree well use, the stabilizer shall be mixed at a minimum rate of 8 lbs. of Stabilizer product per ton of DG aggregate.
   3. Premixed Stabilizer and D.G. material can be obtained locally by contacting the stabilizer manufacturer and obtaining the location of a local vendor.
   4. Drop spreading of the Stabilizer product over raked D.G. screenings and mixing stabilizer by rototilling is NOT ACCEPTABLE.

B. Place the premixed stabilizer product on the pre-soaked subgrade in maximum 2" lifts. Rake smooth to the desired grade and cross slope.

C. After placement and raking, water the Stabilized D.G. to achieve full depth moisture penetration of the placed product. Apply 25 – 45 gallons per ton to achieve the proper full depth moisture penetration.

D. After 6 – 72 hours for activation, roll the Stabilized D.G material with a 2 to 5 ton double drum roller to achieve finish grade and initial compaction without separation, plowing or any other physical compromise of the aggregate. Utilize a hand tamp at edges, around benches, and sign posts. Do not use a vibratory wacker plate or vibratory roller to compact the Stabilized D.G.

E. Finish surface elevation:
   1. Compacted finish surface of DG shall be flush with headers, paving, mowstrips and/or curbs, unless otherwise indicated.
   2. Compacted finish surface of DG shall be two inches above finish grade in adjacent shrub/ground cover planting areas, unless otherwise indicated.
   3. Compacted finish surface of DG shall be one-half inch above finish grade in adjacent sodded turfgrass planting areas, unless otherwise indicated.
   4. Compacted finish surface of DG shall be flush to finish grade in adjacent seeded or sprigged turfgrass planting areas, unless otherwise indicated.

F. Lightly spray the surface after compaction operations. Allow the finished surface sufficient time to dry prior to use.

G. Finished surface shall be smooth, uniform and solid with no evidence of chipping or cracking. Cured and compacted pathway shall be firm throughout profile with no spongy areas. Loose material shall not be present on surface after installation, but may appear after use and according to environmental conditions. Pathway shall remain stable underneath loose granite on top with a “natural” look. Any significant irregularities in path surface shall be repaired to the uniformity of entire installation.

3.3 CLEANUP

A. After all stabilization operations are completed, remove trash, excess materials, empty containers and rubbish from the property. All scars, ruts or other marks in the ground caused by this work shall be repaired and the ground left in a smooth condition throughout the site.

B. The D.G. surface shall be dragged and a final dressing performed within 48 hours prior to final acceptance.

END OF SECTION

SECTION 32 17 23
PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Furnish and paint parking stalls, traffic markings, wording, accessible markings and hatching on asphalt-concrete surfaces.

1.2 RELATED SECTIONS:

A. Section 32 12 17 – Asphalt Paving.
B. Section 32 13 13 – Site Concrete Improvements.
C. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specifications sections, apply to the work of this section.

1.3 REFERENCES

A. SSCDOT - Standard Specifications, California Department of Transportation (Caltrans), latest edition, except for references to methods of payment and to furnishing of materials by State.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product data sheets and certificates of compliance for materials.

1.5 COORDINATION

A. Coordinate work with other work, including associated traffic signing.

B. Commence striping or marking of asphalt-concrete no sooner than 7 days following any sealing of the asphalt-concrete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paint: Quick drying, high visibility water soluble acrylic striping paint; Stripe Master, Wikel Mfg. Company, or similar by Sherwin-Williams, J.E. Bauer, or PPG, or approved equal.

B. Paint shall be of color indicated on the construction plans.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that site is ready for application.

3.2 PREPARATION

A. Identify installation locations. Place parking stall striping, traffic marking, wording, disabled symbol and access striping at locations, as shown on construction plans.

B. Thoroughly clean all surfaces to be painted.

C. Employ equipment and methods appropriate to the work site.

D. Provide vehicular and traffic controls per Division 01.

3.3 INSTALLATION

A. Apply paint striping and marking as indicated on the plans.

B. Apply paint uniformly, straight and true, with equipment designed for traffic striping and marking applications.

C. Apply paint striping and marking per Section 84 of SSCDOT, except supply paint conforming to 2.1 A. of this specification.

D. Apply a minimum of 2 separate coats of paint at all striping and marking locations, including asphalt-concrete and concrete surfaces.

E. Paint international symbol of accessibility at the location as shown on the plans.

F. Paint accessible access area striping at the location as shown on the plans.

3.4 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Division 01.

END OF SECTION

SECTION 32 19 19

ORNAMENTAL METAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Provide all material, labor, equipment and services necessary to completely install all Ornamental Metal materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.

B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
   1. Drawings and general provisions of contract
   2. 32 13 13 Site Concrete Improvements
   3. 31 20 00 Earthwork

1.2 REFERENCES

A. Standards:
   1. In accordance with the following standards:
      a. ASTM American Society of Testing Materials
      b. AWS American Welding Society
      c. NAAMM National Association Of Architectural Metal Manufacturers
      d. NFPA National Fire Protection Association
      e. UL Underwriters laboratories

1.3 SYSTEM DESCRIPTION

A. Performance Requirements: It is the intention of this section and the drawings to form a guide for a complete and operable system. Any items not specifically noted but necessary for a complete and operable system shall be provided under this section.

1.4 SUBMITTALS

A. Product Data: Manufacturer’s information for each type of product indicated.

B. Shop Drawings.
   a. Submit shop drawings showing fabrication and installation of the work of this section including plans, elevations, sections, details of components, and attachments to other units of work.
   b. Layout of fence with dimensions, details, and finishes of component accessories and post foundations.

C. Quality Assurance/Control Submittals:
   a. Manufacturer's Written Instructions:
      1) Submit three (3) copies of manufacturer's written instructions.

D. Closeout Submittals in accordance with the following:
    a. Maintenance Data in accordance with Specification Section - PROJECT CLOSEOUT.
    b. For gate operators to include in maintenance manuals.
    c. Operation Data in accordance with Specification Section - PROJECT CLOSEOUT.
    d. Record Documents in accordance with Specification Section - RECORD DOCUMENTS.

1.5 QUALITY ASSURANCE

A. Qualifications:
    1. Installer Qualifications:
        a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
    2. Manufacturer/Supplier Qualifications:
        a. Firm experienced in successfully producing/supplying steel ornamental picket fence systems, with sufficient production/supply capacity to produce/supply required units without causing delay in the work.

B. Regulatory Requirements:
    1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
        a. CARB Materials and equipment used for this Project shall comply with the current applicable regulations of the California Air Resources Board (CARB)and the Environmental Protection Agency (EPA), in the area where the project is located.
        b. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for operators on gates that must provide emergency access.

1.6 PROJECT CONDITIONS

A. Existing Conditions:
    1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
    2. Conduct work so as not to interfere unnecessarily with adjacent roads, streets, drives and walks.

1.7 OWNER'S INSTRUCTIONS

A. Provide the services of a factory-authorized service representative to provide start-up service and to demonstrate and train the Owner's maintenance personnel as specified below:
    1. Test and adjust controls and any safeties. Replace damaged or malfunctioning controls and equipment.

a. Upon project completion and acceptance, the subcontractor shall issue Owner a warranty against defective workmanship and materials.

1.8 WARRANTY

A. Contractor's General Warranty:
1. Warranty Period: One (1) Year

B. Manufacturer’s Warranty:
1. In accordance with manufacturer's written standard warranty that includes language indicating the products will be free from cracking, peeling, blistering and corroding as indicated for the Warranty Period:
a. Warranty Period: Fifteen (15) Years.

C. Installer's Warranty:
1. Warranty period: One (1) Year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. These products listed herein establish the size, pattern, color range and function selected by the Engineer for this project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
1. Specified product manufacturer, or approved equivalent:
a. Merchants Metals – www.merchantsmetals.com
b. Acceptable alternative manufacturers:
1) Ameristar (Genesis style)

2.2 PRODUCTS

A. Ornamental Fence: Guardsman Ornamental Steel Fence as Manufactured by Merchants Metals
1. Style: Lafayette
2. Nominal Height: 6 feet
3. Nominal Width: 8 feet
4. Components
a. Pickets: Galvanized steel tubular members manufactured per ASTM F2408, with a minimum yield strength of 45,000 psi. Minimum picket size: 3/4” square, 16 gauge with pickets spaced 4-5/8” on-center and 3-7/8” face to face of picket.

b. Rails: 1-3/8” x 1-1/2”, 11 gauge galvanized steel “U” channel, shall conform to the requirements F2408 Sect 5.1.2 galvanized prior to forming, with a minimum yield strength of 50,000 psi., the steel shall be hot-dip galvanized to meet A653/A653M with a minimum zinc coating weight of 0.9 oz/ft2, Coating Designation G-90. Punched rails to receive pickets. Attach pickets to rails with industrial rivets. Attach rails to posts with brackets.

c. Posts: Galvanized square steel tubular members manufactured per ASTM F2408, having minimum yield strength of 45,000 psi.

5. Finishes
   a. Manufactured in compliance with ASTM F2408 - Corrosion Resistance Salt Spray Test per ASTM B117, Impact Resistance per ASTM D2794, and Adhesion per ASTM D3359 Method B. All primary components shall receive a thorough cleaning and pre-treatment with a 10-step process: Hot alkaline cleaner, clear water rinse, hot iron phosphate application, clear water rinse, reverse Osmosis rinse, dry off oven heat, zinc enriched powder primer coat at 2-4 mils., gel oven heat, Ultra polyester finish T.G.I.C. powder coat at 2-4 mils., and final curing oven.

   b. Color: Black

6. Accessories
   a. Industrial drive rivets hold pickets to rails and rails to brackets. Rivets must have a sheer strength of 1,500 lbs. and a holding power of 1,100 lbs.

   b. Rail/Post Brackets: High security bracket as manufactured by Merchants Metals

   c. Post Caps: Cast aluminum or malleable iron or formed steel manufactured to form a weather-tight closure.
      1) Cap style: Standard Post Cap

   d. Final Tops for Pickets: Cast aluminum, attached to pickets by 1/4" rivet. All Finials extend 6" above rail

2.3 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Concrete: Coordinate with Specification Section – SITE CONCRETE IMPROVEMENTS.

C. Non-shrink Grout: Coordinate with Specification Section – SITE CONCRETE IMPROVEMENTS.

D. Expanded Metal

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site verification of conditions:
   1. Prior to the execution of the work under this specification section, inspect the installed work executed under other sections of this Project Manual which, affect the execution of work under this specification section.
   2. Report unacceptable conditions to the Engineer. Do not begin work until unacceptable conditions have been corrected.
   3. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

A. Coordination:
   1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.

B. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

C. Protection:
   1. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work under this specification section.

D. Surface preparation:
   1. Prepare surface in accordance with manufacturer's written instructions and recommendations.

3.3 INSTALLATION

A. General:
   1. In accordance with manufacturer's written instructions and recommendations unless specifically noted otherwise.
   2. In accordance with approved submittals.
   3. In accordance with Regulatory Requirements.
   4. Set plumb, level, and square.

B. Layout:
   1. Lines shall be straight and true.

C. Fence Panel Installation:
   1. Install fence in accordance with manufacturer’s written instructions.
   2. Space posts uniformly at 8’-0” maximum o.c. unless otherwise indicated.

3. Concrete Set Posts:
    a. Drill hole in firm, undisturbed or compacted soil.
    b. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads.
    c. Place concrete around post in a continuous pour.
    d. Vibrate or tamp for consolidation.
    e. Protect aboveground portion of posts from concrete splatter.
    f. Trowel finish around posts and slope to direct water away from posts.
    g. Gate Posts and Hardware: Set keepers, stops, sleeves and other accessories into concrete.
4. Check each post for vertical and top alignment and maintain in position during placement and finishing operation
5. Align fence panels between posts. Firmly attach rail brackets to posts with ¼" bolt and lock nut. Rivet top to bracket to assure security.

3.4 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

END OF SECTION

SECTION 323113
CHAIN LINK FENCING

PART 1 - PART 1- GENERAL

1.1 SECTION INCLUDES

A. Provisions of constructing chain link fence at locations shown on the Construction Documents, including but not limited to:

1. Site chain link fencing and gates.

1.2 RELATED SECTIONS

A. Contract General Conditions and Division 1 Specifications.

B. Section 31 20 00 – Earthwork: Excavation, Filling, and Grading

C. Section 32 13 13 – Site Concrete Improvements.

1.3 QUALITY ASSURANCE

A. Qualifications of Installer

1. Throughout the progress of installation of the work of this Section, provide at least one person who shall be thoroughly familiar with the specified requirements, completely trained and experienced in the necessary skills, and who shall be present at the site and shall direct all work performed under this Section.
2. In actual installation of the work of this Section, use adequate numbers of skilled workmen to insure installation in strict accordance with the contract documents.
3. In acceptance or rejection of work performed under this Section, the Engineer will make no allowance for lack of skill on the part of the workmen.

1.4 PRODUCT HANDLING

A. Protection

1. Use all means necessary to protect the materials of this Section before, during and after installation, and to protect the work of other trades.

B. Replacements

1. In the event of damage, immediately make all repairs and replacements necessary to the satisfaction of the Engineer and at no additional cost to the Owner.

PART 2 - PART 2- PRODUCTS

2.1 The materials and fabrication of chain link fabric shall conform to these specifications, and as shown on the plans and details.

2.2 All ferrous materials shall be new and galvanized. Imperfectly galvanized material or material upon which serious abrasions of the galvanizing occur shall not be used.

2.3 Height - all fencing shall stand at the heights shown on the plans.

2.4 Fabric - chain link fabric shall conform to the specifications of ASTM, designation: A392, Class 1. The wire used in the manufacture of the fabric shall be 9-gauge. All chain link fabric shall be woven into approximately 2 inch mesh. Fabric shall be furnished with knuckling at all selvages. The knuckled selvage shall be used along all corners and edges. Fabric shall be GBW, galvanized before weaving.

2.5 Posts, braces and gate frames - the base material for the manufacture of steel pipe used for posts and braces shall conform to the specifications of ASTM, designation: A53, standard weight, Schedule 40, and the base material for the manufacture of other steel sections used for posts and braces shall be good commercial quality weldable steel.

2.6 All posts, braces and gate frames shall conform to the size and weight designations shown on the plans.

2.7 All posts shall be fitted with rainproof caps designed so as to fit securely over the top of the posts.

2.8 All posts shall be of a total length of not less than the depth of the concrete footing as shown on the plans, plus the length required above ground.

2.9 Posts and braces shall be galvanized in accordance with specifications of ASTM, designation: A123.

2.10 All horizontal braces shall be attached to posts by approved steel fixtures.

2.11 All welding shall conform to the requirements of the Uniform Building Code, UBC, Chapter 22.

2.12 Where the galvanized surface has been burned by welding, all surfaces of the welded connections shall be thoroughly cleaned by wire brushing and all traces of the welding flux and loose or cracked galvanizing removed. The damaged area and weld shall then be painted in accordance with the following details.

A. All galvanized, welded, or damaged surfaces that are to be painted shall first be cleaned by washing with mineral spirit solvent sufficient to remove any oil, grease or other materials foreign to the galvanized coating.

B. After washing, all areas shall be roughened by abrasive blasting using an abrasive that is no larger than 30-mesh. Galvanizing shall not be removed by this operation.

C. After preparation, all galvanized surfaces that are to be painted shall be covered with one application of zinc dust-zinc oxide primer, federal specification TT-P-641, Type II. The zinc dust-zinc oxide paint shall be applied by spraying to produce a complete covering of the galvanized surface.

D. After the application of the zinc dust-zinc oxide paint, one application of pre-treatment, vinyl wash primer, Section 91-2.7 of the state Standard Specifications, shall be applied to such surfaces. The vinyl wash primer shall be applied by spraying to produce a uniform wet film on the surface.

E. Such surfaces shall then be covered with two separate applications of white tint base vinyl finish coat, Section 91-2.22 of the state standard specifications, sufficient to completely cover the preceding color. Paint for the first application shall be tinted with a compatible coloring agent to slightly contrast with the color of the second application. After drying for 24 hours, one application of aluminum paint, finish coat, Section 91-2.8 of the state standard specifications, shall be painted on the welded areas.

2.13 Stretcher bars and other required fittings and hardware shall be steel and shall be galvanized in accordance with the specifications of ASTM, designation: A153.

2.14 All swinging gates and walk gates to be installed with a gate holdback in the concrete mowstrip, unless otherwise noted.

2.15 Concrete mowstrip shall be in accordance with Section 321313.

2.16 Walk gates shall be constructed as per detailed drawings and in accordance with CBC 1133B1.1.1.4 and 1133B.3.

2.17 Accessible walk gates on an accessible path-of-travel shall comply with the following:

1. Gate lever handle latch hardware shall be an accessible, lockable lever type that requires a maximum of 5 pounds of pressure to operate, Von Duprin AX99 series or approved equal keyed to the owner's requirements.
2. Lever handle shall be a "Rhodes" style lever handle
3. Accessible gates shall have a minimum 10 inch high steel bottom kick plates on both sides of the gate, with cavities capped.

4. Exit gates shall have Locinox Mammoth self-closing hinges (silver) or approved equal.

PART 3 - EXECUTION

3.1 All posts shall be set in concrete footings as shown on the plans to within 3 inches of bottom.

3.2 All vertical line and end posts shall be braced to the nearest adjacent vertical post with galvanized horizontal braces as shown on the plans.

3.3 Perimeter fencing chain link fabric shall be fastened to the outside of the fence.

3.4 All fabric shall be stretched and securely fastened to the posts, as follows:

3.5 The fabric shall be fastened to end, corner and gate posts with 3/16 inch by 5/8 inch stretcher bars and not less than 1/8 inch by 3/4 inch stretcher bar bands spaced at one foot intervals for whatever widths of fabric are supplied. The fabric shall be fastened to line posts with tie wires or post clips. Tie wires shall be at least 9-gauge (0.148 inch diameter) steel. Post clips shall be at least 6-gauge (0.192 inch diameter) steel. The wire or clip fasteners shall be spaced at approximately 14 inches on line posts, with a minimum of 5 fasteners per 6 foot high post. Top and bottom edges of the fabric shall be secured to each horizontal brace with tie wires or fastened to tension wire with hog rings spaced at 15 inch maximum intervals. Hog rings shall be at least 9-gauge (0.148 inch diameter) steel. Wire ties shall be given at least one complete turn. Hog rings shall be closed with ends overlapping. The distance from the selvage to the braces or top rails shall be 2 inch maximum and shall be fastened to the brace or rail by wire fasteners spaced at approximately 14 inches with a minimum of 8 fasteners per each 10 foot horizontal span.

3.6 Construct concrete mowstrip at the width as shown on the plans.

END OF SECTION

SECTION 328400

IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all materials, labor, equipment and services necessary to furnish, install and maintain the Irrigation System, accessories and other related items necessary to complete the Project as indicated by the Contract Documents unless specifically excluded.

B. Related Work Specified Elsewhere
   1. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 01 Specification Sections, apply to work of this section.
   2. Section 31 20 00 – Earthwork
   3. Section 31 23 33 – Trench Excavation and Backfilling
   4. Section 32 90 00 – Landscape Planting

1.2 CODES AND REGULATIONS

A. All work and materials shall be in full accordance with the following codes adopted and amended by the authority having jurisdiction. Nothing in these drawings or specifications is to be construed to permit work not conforming to these codes. The work described in these specifications shall govern in the event that the drawings or specifications call for material or methods of construction of higher quality or standard than required by these codes.
   1. California Plumbing Code
   2. California Administrative Codes:
      a. Title 8, Industrial Relations
      b. Title 19, Public Safety
   3. California Electrical Code
   4. Standards and Regulations of other agencies, water utility provider, or organizations as listed in this specification relating to products or procedures, e.g. American Society for Testing and Materials.

1.3 DEFINITIONS

A. Piping: All pipe fittings, valves, and accessories as required for a complete piping system.

B. PVC: Polyvinyl Chloride.

C. Agencies and Organizations:

1. ASTM- American Society for Testing and Materials
2. AWWA- American Water Works Association
3. IAPMO- International Association of Plumbing and Mechanical Officials
4. NEC - National Electrical Code.
5. UL - Underwriter's Laboratories
6. SSPWC – Standard Specifications for Public Works Construction, by the American Public Works Assoc./Associated General Contractors of California.

D. Owner: An authorized representative of the Owner or the Owner's authorized consultant.

1.4 QUALITY ASSURANCE

A. The work of this section shall be performed by a single firm experienced in irrigation work and holding a current California Contractor's A or C27 License.

B. Qualifications of Workers

1. The Contractor shall employ skilled workers who are thoroughly trained and experienced in irrigation system installation and who are completely familiar with the specified requirements and methods needed for proper performance of this work.
2. The Contractor shall provide adequate supervision by a qualified foreman fluent in English that will be continuously onsite during the performance of this work.

1.5 SUBMITTALS

A. An operational assessment report of any existing irrigation system in the area of work shall be submitted prior to the start of the project's work, including demolition and clearing. See Subsection 1.7.

B. The Contractor shall submit complete lists of proposed materials and equipment per the Division 01 Submittal Section, including manufacturer's name and model numbers. Only provide additional product data and/or catalog cut sheets if a substitute material or equipment is proposed. No substitution will be allowed without prior written approval.

C. Shop drawings shall be provided for the layout and description of all equipment assemblies, including dimensions, capacities, and other characteristics as listed in product specifications. Shop drawings for booster pump assemblies shall clearly and neatly indicate the layout of the assemblies and proposed piping in the pump yard, and shall show adjacent equipment, required clearances, walls, fences, piping and other existing permanent improvements affecting the layout. Materials and equipment shall not be ordered until given written acceptance. Equipment or materials installed or furnished without prior approval or acceptance may be rejected and the Contractor shall be required to remove such materials from the site at his own expense.

D. When specific name brands of equipment and materials are used, they are intended as preferred standards only. This does not imply any right upon the part of the

Contractor to furnish other materials unless specifically approved in writing as equal in quality and performance by the Owner. Decisions by the Architect/Engineer shall govern as to what name brands of equipment and materials are equal to those specified on the plans and his decisions shall be final. It shall be the responsibility of the Contractor to furnish proof as to equality of any proposed equipment or material.

E. Approval of any item, alternate or substitute indicates only that the products apparently meet the requirements of the drawings and specifications on the basis of the information or samples submitted. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

F. Acceptance of any submittals, deliverables, or other work product of the Contractor shall not be construed as assent that the Contractor has complied with, nor in any way relieved the Contractor of compliance with (i) the applicable standard of care, and/or (ii) applicable statutes, regulations, rules, guidelines, and contract requirements.

G. Irrigation Equipment: When the Contractor desires to transfer salvaged irrigation equipment and/or new spare equipment and/or parts to the Owner, he must submit along with the equipment an itemized list. The Contractor is solely responsible to obtain a written confirmation by the Owner that all materials received by the Owner matches his material list. The transfer of materials will not be considered executed without written confirmation of same.

H. Submit any required or requested testing data and/or Certificates, including but not limited to the backflow prevention assembly testing Certificate after the assembly is installed prior to regular system operation.

1.6 EXPLANATION OF DRAWINGS

A. The intent of the drawings and specifications is to indicate and specify a complete and efficient sprinkler irrigation system ready for use in accordance with the manufacturer's recommendations, and all applicable local codes and ordinances. Interpretation of irrigation plans and specifications shall be the responsibility of the Landscape Architect or Owner.

B. All existing systems and improvements are shown in their approximate locations. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions and shall report any variations to the Owner.

C. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, etc., which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all his work, and plan his work accordingly, furnishing such fittings, etc., as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed in the most direct and workmanlike manner, so that conflicts between sprinkler systems, planting, utilities, and architectural features will be avoided. Locate pipe, valves and other equipment in planting areas unless specifically noted otherwise.

D. All work called for on the drawings by notes shall be furnished and installed whether or not specifically mentioned in the specifications.

1.7 EXISTING CONDITIONS

A. The Contractor shall not install the irrigation system and equipment as shown on the Drawings when it is obvious in the field that obstructions or differences in existing conditions and/or systems are present. Such obstructions or differences should be immediately brought to the attention of the Owner. Failure to provide notification prior to the start of this work shall make the Contractor liable for any and all repairs and/or corrections necessary for proper functioning and coverage of the system without any additional cost to the Owner.

B. The Contractor shall examine carefully the site of work contemplated and the proposal, plans, specifications, and all other contract documents. By submitting a bid, the Contractor attests that he has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and quantity of work to be performed and materials to be furnished, and the requirements of the specifications. The Contractor shall take necessary precautions to protect existing site conditions that are to remain. Should damage be incurred, the Contractor shall make the necessary repair or replacement to bring it back to its original condition at his own expense.

C. Prior to cutting into the soil, the Contractor shall coordinate with the Owner to locate all cables, conduits, sewers, septic tanks, and other such underground utilities as are commonly encountered and he shall take proper precaution not to damage or disturb such improvements. If a conflict exists between such obstacles, notify the Owner who will consider realignment of the proposed work. The Contractor will proceed in the same manner if a rock layer or any other condition encountered underground makes change advisable. Should utilities not shown on the plans be found during excavations, Contractor shall promptly notify the Owner for instructions as to further action. Failure to do so will make Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities not shown in plans.

D. The Contractor shall verify the correctness of all finish grades within the work area in order to insure the proper soil coverage (as specified) of the sprinkler system pipes. The Contractor shall verify and be familiar with location and size of the proposed water supply (P.O.C.). He shall make approved type connection and install new work.

E. The Contractor shall be responsible for notifying the Owner prior to installation that equipment or methods indicated on the drawings or in the specifications conflict with local codes, are incompatible or an error is apparent. It the event the Contractor neglects to do this, he will accept full responsibility for any revisions necessary.

1.8 PERMITS

A. The Contractor shall obtain and pay required fees to any governmental or public agency. Any permits for the installation or construction of any of the work included under this contract, which are required by any of the legally constituted authorities

having jurisdiction, shall be obtained and paid for by the Contractor, each at the proper time. He shall also arrange for and pay all costs in connection with any inspections and examination required by these authorities.

1.9 TESTING

A. General: Unless otherwise directed, tests shall be witnessed by the Owner. Work to be concealed shall not be covered until prescribed tests are made. Should any work be covered before such tests, the Contractor shall, at his expense, uncover, test and repair his work and that of other contractors to original conditions. Leaks and defects shown by tests shall be repaired and entire work re-tested. Tests may be made in sections, however, all connections between sections previously tested and new section must be included in the test.

B. Main Line Piping: Maintain 125 psi water or air pressure in new main line piping for a duration of twenty-four (24) hours. There shall be no drop in pressure during test except that due to ambient temperature changes (+/- 5psi).

C. After being installed at the project site, any newly installed Backflow Prevention unit must be tested and approved as functioning properly per the local water agency requirements. Approval of the backflow prevention unit must precede any final inspection of the irrigation system. All costs for testing shall be the responsibility of the Contractor.

1.10 OBSERVATION

A. General:
   1. Installation and operations must be approved by the Owner.
   2. In no event shall the Contractor cover up or otherwise remove from view any work under this contract without prior approval of the Owner. Any work covered prior to inspection shall be opened to view by the Contractor at his expense.
   3. In all cases, where inspection of the irrigation system work is required and/or where portions of the work are specified to be performed under the direction and/or inspection of the Owner’s Representative, the Contractor shall notify the Owner’s Representative at least 48 hours in advance of the time when such inspection and/or direction is required. Any necessary re-excavation or alterations to the system needed because of failure of the Contractor to have the required inspection, shall be performed at the Contractor's own expense.

B. Periodic observations shall be required for basic operations and installations during progression of the project. The Owner’s Representative, Owner or Landscape Architect shall perform the observations and shall record the observation on the Irrigation System Observation Log form on the As Built Record Drawings. Such observations will include but not necessarily be limited to the following items as included in the scope of work:
   1. Layout and flagging of sprinkler heads.
   2. Trenching.
   3. Main line installation.

4. Main line sustained pressure check.
5. Wire placement.
6. Partial fill compaction of trenches.
7. Control valve installation.
8. Irrigation controller installation and operation.
9. Sprinkler/emitter coverage prior to the start of planting operations.
10. Overall system operation and primary/secondary communication.

C. Coverage & Operations Review:
1. When the irrigation system is operational and prior to soil conditioning operations, the Contractor in the presence of the Owner shall perform a coverage test of the irrigation system. The Contractor shall furnish all materials and labor required to perform the coverage test and to correct any minor inadequacies of coverage disclosed. The Contractor shall inform the Owner and Owner of any deviation from the plan required due to wind, planting, soil, or site conditions that bear on proper coverage. If such notification of necessary corrections or additions to the irrigation system is not provided prior to or during the coverage test, the Contractor shall make all subsequent adjustments and corrections needed for proper coverage without any extra cost to the Owner.
2. Prior to the start of the maintenance period, the irrigation system shall be reviewed by the Owner for proper operations, and a review of and training on equipment and associated controls performed. Any corrections and/or adjustment shall be made as a condition for the start of the maintenance period and subsequent Final Acceptance.
3. Submit a Pump Start-up and Training Report after start-up. Include a copy in the O&M manual.

D. Final Acceptance: The work will be accepted in writing when the entire project improvements have been completed to the satisfaction of the Owner. In judging the work, no allowance for deviation from the original plans and specifications will be made unless already approved in writing at proper time. Should it become necessary for the Owner to occupy any portion of the work area before the contract is fully completed, such occupancy shall not constitute acceptance. The Contractor will not be responsible for any damage caused by the Owner's separate work forces.

1.11 REJECTION OF NON-CONFORMING MATERIAL OR WORK

A. The Owner reserves the right to reject any material or work which does not conform to the contract documents. The rejected material or work shall be removed or corrected by the Contractor at no additional cost to the Owner.

1.12 OPERATIONS AND MAINTENANCE INSTRUCTIONS & RECORD DOCUMENTS

A. The Contractor shall prepare and deliver to the Owner’s Representative within ten (10) calendar days prior to completion of the construction and as a prerequisite to the start of the maintenance period, all required and necessary descriptive material in complete detail and sufficient quantity, properly prepared in two individually bound sets of Operating and Maintenance Manuals. These manuals shall describe the material

installed and shall be in sufficient depth to permit operating personnel to understand, operate and maintain all equipment. Spare part lists and related manufacturer identification shall be included for each installed equipment item. Each complete, bound manual shall contain the following information:

1. Cover sheet stating Contractor's address and telephone number, duration of guarantee period, and a list of equipment, with names and addresses of local manufacturer representatives and warranty periods.
2. The Contractor to issue a "CERTIFICATE OF CONSTRUCTION COMPLIANCE" which indicates that all work done, materials and equipment used and installed are in compliance with the approved plans, specifications and all authorized revisions and that the system functions properly.
3. Complete operating and maintenance instructions and warranties on all major equipment.
4. Complete set of manufacturer's literature and specifications of material installed, including parts list.
5. A list of the controller station number for each control valve if different than the control valve number shown on the drawings.
6. Initial electrical data on each control valve:
    a. Ohms reading for each valve taken at the controller (circuit is OFF).
    b. Voltage reading for each valve taken both at the controller and at the valve (circuit is ON).

B. The contractor shall furnish one set of As-Built full-scale drawings on bond, and two compact disks with complete sets of digital PDF files of all close-out documents after the As-Built Record Drawings have been reviewed and accepted by the Landscape Architect.
    1. Label first page of each document, or set of documents, "AS-BUILT PROJECT RECORD" in neat large printed letters on lower right hand corner. Record information concurrently with construction progress. Prints for this purpose may be obtained from the Owner. This set of drawings shall be kept on the site and shall be used only as a record set. Do not conceal any work until required information is recorded. These drawings shall also serve as work in progress sheets, and the Contractor shall make **neat and legible** annotations thereon daily as the work progresses, showing the work as actually installed. These drawings shall be available at all times for inspection and shall be kept in a location designated by the Owner.
    2. Drawings: Legibly mark to record actual construction:
        a. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements. Give sufficient horizontal and vertical dimensions to accurately trace route and depth of each concealed line or item. Accurately locate each capped, plugged or stubbed line.
        b. Field changes of dimension and detail.
        c. Changes made by Field Order, Addenda, or other change document.
        d. Show the final controller station number for each control valve if different than the control valve number shown on the drawings.
    3. Deliver all Close-out Documents (As-Builts) to the Owner. Accompany submittal with transmittal letter in duplicate, containing:
        a. Date.

b. Project title.
c. Contractor's name and address.
d. Title and number of each Record Document (As-Built).
e. Signature of Contractor or his authorized representative.

C. The Contractor shall provide controller chart(s) as follows:
1. The Contractor shall provide two controller charts for each controller’s area of work.
2. The chart shall show the area of work controlled by the automatic controller and shall be the maximum size that the controller door will allow.
3. Show the controller station number for each control valve if different than the control valve number shown on the drawings.
4. The chart may be a reduced drawing of the actual as-built system. However, in the event the valve numbering is not legible when the drawing is reduced, it shall be enlarged to a size that will be readable when reduced.
5. The chart shall be colored with a different permanent color for each station.
6. The chart shall be enclosed in a waterproof envelope or laminated.

1.13 SPARE PARTS AND EQUIPMENT

A. Prior to the conclusion of the maintenance period, furnish the Owner with the following spare parts and equipment:
1. Ten spare nozzles for each different sprinkler head arc and/or radius nozzle installed.

1.14 WORK AREA AND SAFETY

A. The Contractor shall furnish, erect, and maintain all temporary facilities; perform all temporary work during the period of construction, including those herein specified. All facilities shall be maintained in proper and safe operating and sanitary conditions at all times.

B. The Contractor shall comply with the provisions of the Construction Safety Orders, and General Safety Orders issued by the State Division of Industrial Safety, as well as all other applicable laws, ordinances and regulations.

C. The project site shall be maintained in a neat and safe condition at all times. Cleanup shall be accomplished as the work progresses and upon completion of the work. The Contractor shall provide adequate safety measures to protect workers and the public from injury.

1.15 GUARANTEE

A. Irrigation system consisting of materials, equipment and workmanship shall be guaranteed for proper operation a minimum of one year from date of Final Acceptance of the Work or the Notice of Substantial Completion of the Project, whichever is later.

Manufacturer’s warranty periods may be longer, and shall be noted in the close-out documents.

B. The Contractor shall be held responsible for repair and/or replacement of damages to new or existing improvements resulting from the defects of materials, equipment or workmanship one year from the date of Final Acceptance of the Work or the Notice of Substantial Completion of the Project, whichever is later.

C. The Owner reserves the right to make temporary repairs as necessary to keep the irrigation 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 Guarantee as herein specified.

D. The Booster Pump Assembly shall have a minimum 2 year warranty with no-cost annual service checks over the Warranty Period. See the Booster Pump Assembly and Controls execution section for additional requirements.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Schedule rated white rigid PVC Pipe shall be made from NSF approved Type 1, Grade I, PVC compound conforming to ASTM D-1785.

B. Class rated (Standard Dimension Ratio) white rigid PVC Pipe shall be made from NSF approved Type 1, Grade I, PVC compound conforming to ASTM D-1784.

C. PVC pipe shall be of the Class or Schedule as follows:

1. PVC pipe shall meet ASTM D-2241 for solvent weld, plain end, ASTM D-2672 for solvent weld, bell end, and ASTM D-3139 for gasketed bell end. Pipe shall be of the Schedule and/or Class as shown on the Drawings.
2. Pipe sleeves under paving shall be PVC Schedule 40 for 3-inch and smaller or SDR 35 for 4-inch and larger pipes.
3. Riser and/or manifold pipe connecting valves to main line fittings shall be Schedule 80 PVC.

D. All pipes shall be continuously and permanently marked and conform with the following information: manufacturer's name or trademark, nominal pipe size, Schedule or Class of pipe, pressure rating in PSI, ASTM designation and (NSF) seal of approval.

E. White rigid polyvinyl chloride (PVC) Fittings:

1. Schedule 40 type I and II grade 1, solvent weld socket fittings ASTM D-2466 for all lateral lines.

2. Schedule 80 type I and II grade 1 solvent weld socket fittings ASTM D-2464 for all main line less than 4 inches diameter.
3. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable (IPS) schedule, and (NSF) seal of approval.
4. All plastic fittings and connectors shall be injection molded of an improved polyvinyl chloride compound featuring high tensile strength, high chemical resistance and high impact strength in terms of current ASTM standards for such fittings. Where threads are required in plastic fittings, these shall be injection molded also.

F. PVC Solvent Weld Adhesive: All socket and bell type connections shall be joined with primer and PVC solvent cement which shall meet the requirements of ASTM F656 for primer and ASTM D2564, "Standard Specification for Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings." Solvent cement joints for plastic pipe and fittings will be made as prescribed by manufacturer. The high chemical resistance of the pipe and fitting compounds specified in the foregoing sections makes it mandatory that an aggressive colored primer, which is a true solvent for PVC be used in conjunction with a solvent cement designed for the fit of pipe and fittings specified. A heavy bodied, medium set solvent cement, e.g. Weld-On 711 gray, shall be used for all classes and schedules of pipe and fittings.

G. PVC Pipe Thread Sealant: A non-hardening all purpose sealant and lubricant similar to Permatex #51 or Lasco blue pipe thread sealant which is certified by the manufacturer to be harmless to PVC pipe and fittings. Apply sealant to clean male threads, brushing into grooves and to the first three threads of the female threads. A good quality grade of teflon tape recommended by the manufacturer for use with plastics may be used in lieu of sealant. Minimum width of tape to be used is 3/4". A minimum of two wraps and a maximum of three wraps to be used.

H. PVC Swing Joints: Connections to sprinkler heads from lateral lines shall be made with swing joints as detailed. Pre-assembled swing joints from Hunter, King Brothers or Spears are acceptable.
1. Use 6” length nipples for 1/2 inch inlet heads.
2. Use 12” length nipples for 3/4 or 1 inch inlet heads.

I. Coated Ductile Iron pipe and fittings:
1. Ductile Iron pipe shall be centrifugally cast pipe conforming to ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51, thickness Class 50, with cement - mortar lining and seal coating per ANSI/AWWA C104/A21.4.
2. Ductile Iron flanged pipe shall conform to ANSI/AWWA C115/21.15.
3. Joints shall comply with the following standards:
    a. Rubber gasketed/mechanical joints: ANSI/AWWA C111/A21.11.
    b. Flanged joints: ANSI/AWWA C110/A21.10, B16.1, B16.2.

J. Coated ductile iron push-on mechanical fittings meeting ANSI/AWWA C110 or C153/A21.10 shall be used for:
1. Main line connections for pipe 4 inches and greater in diameter.
2. New main line service tee at valve connections.
3. Self-restrainted fittings shall be used for bell x flange or bell x threaded fittings.

K. Coated ductile iron service saddles with stainless steel double straps, Romac Industries 202S or equal, shall be used for electric control/quick coupler valve service connections on existing main lines 3 inch or greater.

L. Galvanized pipe and fittings:
   1. Galvanized Pipe shall be hot dip galvanized continuous welded, seamless steel SCH 40 pipe conforming to current ASTM A53 standards.
   2. Galvanized Fittings shall be galvanized, threaded malleable iron SCH 40 conforming to current ASTM A865 standards.

2.2 BACKFLOW PREVENTION ASSEMBLY

A. The backflow prevention assembly is existing and shall remain in place.

2.3 VALVES

A. Electric Control Valves:
   1. Globe valves operated by low-power solenoid, normally closed, manual flow adjustment. Sizes and types as shown on drawings.
   2. Provide a pressure regulating module on all control valves, or other pressure regulating components as part of the operating spray head or low volume head zones when the dynamic system pressure is, or may be greater than 45 psi.

B. Control Valve Marking: Christy's valve identification tag (or equal), yellow color with text designating controller and valve station number, e.g. "A12", or equivalent.

2.4 VALVE BOXES

A. Control Valve/Master Valve/Flow Sensor boxes:
   1. Shrub/Ground Cover areas: Carson 1419 body with lockable tan plastic cover, or equivalent. Drip Valve Kits shall use a Jumbo body with lockable tan plastic cover.
   2. Turfgrass areas: Carson 1419 body with lockable green plastic cover, or equivalent.
   3. Hardscape areas: Christy B16 concrete box (11.75" x 22.25") with N16R composite lid, or equivalent.

B. Control Valve box marking: Plastic lids shall have a branded markings, and concrete lids shall have an embossed, anodized aluminum labels permanently attached to the top of lid with minimum 1" high letters showing controller letter and station number.

2.5 CONTROLLER

A. The irrigation controller is existing and shall remain in place. Verify open stations and spare wires,if any in the area of work.

2.7 CONTROL AND TRACER WIRE, COMMUNICATION CABLE

A. Connections between the automatic controllers and the electric control valves, and tracer wire shall be made with direct burial AWG - UF 600 volt copper wire manufactured for irrigation system use.

B. Hot control wires for the first controller shall be red. If multiple controllers are installed, the hot wire color shall be orange, yellow, purple in order for each controller. Common ground wire shall be white, with a color stripe corresponding to the hot control wire color when multiple controllers are installed. Spare control wires shall be black and spare common wire blue. Tracer wire shall be green.

C. Install in accordance with valve manufacturer's specifications and wire chart. In no case shall wire size be less than #14. Common wire shall be a minimum #12 size.

D. All control wire splices/caps shall be made with direct bury rated, waterproof wire connectors with silicone sealant, Spears DS-500 Dri-Splice, 3M DBR/DBY or approved equal. Use one splice per connector sealing pack.

E. Apply numbered wire markers at both sides of all splices and at the controller terminal board corresponding to the controller and station number. If multiple valves are connected to one station, add a two digit identifier to the station number (X), e.g. X01, X02, etc. Use HellermannTyton Clip-tags nylon numbered wire markers or approved equal.

2.8 IRRIGATION HEADS

A. Spray/Bubbler Pop-up Head: Molded plastic body with pop-up plastic riser and nozzle. Refer to schedule on drawings. Manufacturer's model numbers are listed with description.

B. Rotor Pop-up Head: Molded plastic body with plastic riser and nozzle, stainless steel clad riser if specifically noted or standard. Gear driven rotation with memory arc, balanced nozzle sets. Manufacturer's model numbers are listed with description.

2.9 BOOSTER PUMP ASSEMBLY AND CONTROLS

A. The booster pump is existing and shall remain in place.

2.10 CONCRETE

A. Cast-in-place Portland cement concrete used for pipe encasement, cover, thrust blocks, pipe support or other below-grade use shall at minimum comply with 2,800 psi 28 day strength.

2.11 OTHER MATERIALS

A. Materials not specifically indicated but necessary for the proper execution of this work shall be of first quality as selected by the Contractor subject to the acceptance of the Owner.

B. All materials appearing in the legend and details of the irrigation drawings are to be furnished and installed by the Contractor unless specifically noted to the contrary. Contractor is responsible for installation according to plans and details. The system shall efficiently and uniformly irrigate all areas and perform as required by these plans and specifications.

C. Granular bedding material shall be clean natural occurring sand, free from clay, salt, sea shells or organic material, suitable for the purpose intended, and shall be of such size that 90 percent to 100 percent will pass a No. 4 sieve and not more than 5 percent will pass a No. 200 sieve.

PART 3 - EXECUTION

3.1 SYSTEM DESIGN AND VERIFICATION

A. Contractor shall verify existing pressure and any existing irrigation equipment, and shall inform the Owner of any discrepancies between the exsiting systems' make and model of equipment, such as sprinkler heads, control valves, etc., and those indicated in the Drawings in writing prior to the start of irrigation system installation. Failure to inform the Owner of any discrepancy within seven working days prior to beginning of system installation will place the responsibility of any and all corrective action on the Contractor at no expense to the Owner.

3.2 PIPING INSTALLATION

A. General:

1. Any equipment installed by the Contractor and deemed to be for the use of the Owner in various situations (i.e., control valves, control panels, etc.) shall be so installed to be readily accessible and quickly operable. Equipment deemed by the Owner to be inoperable for its intended purpose shall be reinstalled by the Contractor in an operable position before approval will be given. Any changes made by the Contractor shall be done without any additional cost to the Owner.
2. The Contractor shall be responsible for layout of proposed facilities and any minor adjustments required due to differences between existing conditions and the Drawings. Any such deviations in layout shall be within the intent of the original drawings, and without additional costs to the Owner. The Owner will indicate the proposed precise location of the control panels. Head spacing on drawings is diagrammatic. Head spacing and patterns shall be adjusted to provide complete and adequate coverage with a minimum spray on non-planted areas. Where head spacing is not specifically noted, Contractor shall install sprinkler heads evenly along the irrigation area's perimeter. Flush all lines prior to installation of heads.

3. Support piping without strain on joints or fittings and allow for piping expansion and contraction. "Snake" pipe into trench in accordance to manufacturer's recommendations to allow for expansion. Lay on solid bedding, at uniform depth.

B. The Contractor shall examine all other portions of working drawings and plan trenching and pipe layout so that no conflict will arise between irrigation and any other work. Any corrective action will be the Contractors responsibility at no further expense to the Owner.

C. Excavations:

1. Excavations shall be open vertical construction, sufficiently wide to provide clear working space around the work installed and to provide ample space for backfilling and tamping.
2. The use of a vibratory plow or methods other than open vertical trenching will not be allowed without the written approval of the Owner. To obtain such approval, a field test must be performed, at the proposed site, with the equipment to be used in the presence of the Owner and Owner. The field test is to indicate if the proposed site is favorable to the plowing method. Approval for plowing at one location does not allow the use of plowing at another location. Approval for plowing must be obtained for each location where the use of plowing is proposed. If, at previously approved plowing locations, conditions for plowing become unfavorable as determined by the Owner, plowing shall be terminated.
3. Trenches for pipe and equipment shall be cut to required grade lines, and compacted to provide an accurate grade and uniform bearing for the full length of the line.
4. Unless written approval for using native soils as bedding material is given by the Owner, main line pipe shall be placed on a minimum 6 inch depth of granular bedding material.
5. Excess trench soil with rocks greater than ½ inch diameter shall be removed from the planted area and spread as directed by the Owner.
6. When two pipes are to be placed in the same trench, it is required to maintain a minimum four inch (4") horizontal separation between pipes.
7. Depth of trenches shall be sufficient to provide a minimum cover above the top of the pipe as follows:
    a. 24-inch minimum over main lines.
    b. 18-inch minimum over non-pressure (rotary pop-up) lateral lines.
    c. 12-inch minimum over non-pressure (pop-up spray head) lateral lines.
    d. 24-inch minimum over any lines located out in road surface area of paved streets.
    e. Maximum cover above the top of the pipe shall not exceed twelve inches (12") greater than the required minimum cover.
    f. 12-inch minimum cover over drip line non-pressure lateral lines.
    g. 4-inch minimum cover over in-line emitter or main distribution tubing.

D. Assemblies:

1. Routing of pressure supply lines as indicated on drawings is diagrammatic. Install lines (and various assemblies) in such a manner as to conform with details on plans.

2. Install all assemblies specified herein according to the respective detail drawings or specifications pertaining to specific items required to complete the work. Perform work according to best standard practice.
3. Install no multiple assemblies on plastic lines. Provide each assembly with its own outlet.
4. All threaded pipe and fittings shall be assembled using an approved teflon tape, or equivalent, applied to the male threads only. A minimum of two (2) wraps and a maximum of three (3) wraps of an approved teflon tape will be required.
5. No main line elbows, branch tees or isolation valves are to be located closer than five (5) feet to each other without prior approval of the Owner.

E. Line Clearance: All lines shall have a minimum clearance of four inches (4") from each other, and six inches (6") from lines of other trades. Parallel lines shall not be installed directly over one another.

F. Plastic to Steel Connections:
1. At all plastic (PVC) pipe connections, the Contractor shall work the steel connections first. Connections shall always be plastic into steel, never steel into plastic. An approved teflon tape shall be used on all threaded (PVC) to steel, never steel into plastic. An approved teflon tape shall be used on all thread (PVC) to steel pipe joints applied to the male threads only, and light wrench pressure is to be applied. A minimum of two (2) wraps and a maximum of three (3) wraps of an approved 3/4" wide teflon tape will be required.
2. A non-hardening sealant and lubricant similar to Permatex #51 or LASCO blue pipe sealant may be used in lieu of teflon tape. Apply sealant to clean male threads brushing into grooves and to the first three threads of the female threads.

G. Plastic Pipe:
1. The Contractor shall exercise care in handling, loading, unloading, and storing plastic pipe and fittings. All plastic pipe and fittings shall be stored under a weatherproof roofed structure before using and shall be transported in a vehicle with a bed long enough to allow the length of pipe to lie flat so as not to be subject to undue bending or concentrated external load at any point.
    a. All lumber, rubbish, rubble, concrete and rocks shall be removed from the trenches by the Contractor. Pipe shall have a firm uniform bearing for the entire length of each pipe line to prevent uneven settlement. Wedging or blocking under riser tees shall be done only if specified on the plans. Pad trenches with soil as necessary to provide uniform bearing surfaces.
    b. Where extensive lengths of pipe are installed, snake pipe in trench from side to side to allow for expansion and contraction. One additional foot per one hundred (100) feet of pipe is the minimum allowance for snaking. Never lay pipe when there is water in the trench or when the temperature is 32 degrees F or below.
    c. All changes in direction of pipe shall be made with fittings, not by bending. No main line fittings for changes in direction shall be greater than 45 degrees. Provide a minimum five (5) feet between changes in direction elbows.
    d. Safely handle primers and cements per ASTM F-402. Make solvent weld joints per ASTM D-2855 with a non-synthetic bristle brush in the following sequence:

1) Make sure pipe is cut square and all rough edges and burrs are removed. All connecting surfaces are properly cleaned and dry prior to application of pipe primer.
2) Apply an even coat of colored primer to pipe and fitting prior to application of solvent.
3) Apply an even coat of solvent to the outside of the pipe, making sure that the coated area is equal to the depth of the fitting socket.
4) Apply an even light coat of solvent to the inside of the fitting.
5) Apply a second coat of solvent to the pipe.
6) Insert the pipe quickly into the fitting and turn pipe approximately one-eighth to one-quarter turn to distribute the solvent and remove air bubbles. Hold the joint for approximately fifteen seconds so the fittings do not push off the pipe.
7) Using a clean rag, make sure to wipe off all excess solvent to prevent weakening at joint.
8) Exercise care in going to the next joint so that pipe is not twisted, thereby disturbing the last completed joint.
9) Allow at least fifteen minutes setup time for each welded joint before moving.
10) Repairing plastic pipe when damaged shall be done by replacing the damaged portion of pipe.

H. Concrete Thrust Blocks: Concrete anchors or thrust blocks shall be provided on pressure main pipelines 2 inches or greater in diameter at abrupt changes in pipeline grade, changes in horizontal alignment (bends, tees and crosses), reduction in pipe size (reducers, reducing tees or crosses), end-line caps or plugs, and/or in-line isolation valve to absorb any axial thrust of the pipeline. The pipe manufacturer's recommendation for thrust control shall be followed. Thrust blocks must be formed against solid unexcavated earth (undisturbed). Do not enclose entire joint in concrete. Provide a minimum of two cubic feet of concrete for each thrust block.

I. Concrete thrust blocks may be eliminated if the main line piping system uses self-restrainted fittings and bell joint restraints throughout.

3.3 PIPE DEPTH AND BACKFILL

A. Backfill shall not be placed until the installed system has been inspected, pressure tested and approved by the Owner.

B. Backfill for first 6 inches underneath, and 4 inches around and above main line pipe and control wires shall be granular bedding material, unless the Owner approves in writing that native soil may be used for initial backfill in lieu of granular bedding material. Backfill material for the upper portion of the trench shall be approved soil. Unsuitable martial, such as pipe remnants and wire including clods and rocks over two inches (2") in size, shall be removed from the premises and disposed of legally at no cost to the Owner.

C. Backfilling for all pipe shall be carried out in two basic stages.
   1. Stage One Backfilling: This shall be accomplished as soon as possible after the pipe is laid. A bedding of uniform depth with no voids must be provided along the entire length of the pipe. The bedding material should be placed in the trench and tamped into the areas under the pipe, using a suitable tool. Joints should be left exposed until hydrostatic tests are completed. Cover only those portions of the pipe necessary to prevent movement or damage.
   2. Stage Two Backfilling: This shall be completed after all hydrostatic tests are completed and the piping system has been thoroughly checked for leaks or other defects. Continue to add backfill material in four inch (4") layers and hand tamp to achieve density similar to adjacent soil. After twelve inches (12") in main line trenches and eight inches (8") in lateral line trenches of hand tamped soil is in place over the pipe and fittings, backfilling can be continued, using light machinery to place dirt in the trenches in six inch (6") layers and to compact the dirt to conform to adjacent soil. Extreme care should be taken to avoid damage to the pipe from machinery that is too heavy. All trenches shall then be water jetted to assure uniform settling and compaction. Backfilling operations will not be considered complete until the top surface has been graded to conform to the adjacent soil. All rocks uncovered and not used as backfill must be collected and removed from the site.

D. All backfilling shall be done carefully and shall be properly tamped. All soil shall be tamped and puddled to eliminate any voids.

E. Surplus earth remaining after backfilling shall be disposed of as directed by the Owner.

F. PVC piping and fittings shall not be backfilled during periods of extreme heat or when a sudden lowering of temperature of the pipe may cause separation of joints or fittings.

G. Contractor shall fill with properly amended topsoil any irrigation trench that subsides during the warranty period. Contractor shall assume all cost associated with the trench repair, including but not limited to plant replacement of a size of plant disturbed at the time of the repair.

3.4 CONTROL AND TRACER WIRE

A. Protect wire by running alongside of mainline piping. Do not tape wire together when encased in sleeve. Minimum cover shall be 24 inches. Crimp wires together at valve manifold with Scotchlok connector. Conventional valve wire splices shall use a 3M DBY splice kit. Tag all control wire at splices with approved control wire markers.

B. Wire size shall be determined by the number of valves operating on a given wire and the distance from the controller to the farthest valve, as specified by the charts

furnished by the remote control valve manufacturer. Splices are only allowed when rerouting or repairing existing wire. All splice connections must be provided in a valve box.

C. Install tracer wire along the top of pipe at the following locations:
   1. All pipe sleeves.
   2. Main line pipe without adjacent control wire.

3.5 VALVES

A. The Contractor shall make all necessary connections for operation, and shall be connected and aligned to provide the most efficient flow of water to the irrigation heads. Where pressure regulating electric control valves are specified, the Contractor shall adjust the valve so a uniform distribution of water is applied by the heads, and that the most remote heads operate at the pressure recommended by the head manufacturer.

B. Each valve is to be enclosed in a separate valve box. The valve box shall be secured on firm soil clear of valves and wiring connections. Valve boxes and lids shall be set to finished grade as indicated on the Drawings. Use valve box extensions of the same material as the box to the proper depth below the pipeline. Valve boxes shall be supported by common bricks at each corner and at the long side of the box. Use a minimum of six bricks to support rectangular boxes and four bricks to support round boxes. Backfill carefully and properly compact in order to prevent settlement and subsequent damage.

C. Install a concrete collar around valve boxes when located in asphaltic concrete pavement or in general non-sportsfield turfgrass areas.

D. When existing valve and/or splice boxes are within the area of work, replace in kind any damaged boxes and/or lids, unless noted otherwise. Adjust the elevation of all existing boxes within the area of work to final grade per the drawings.

E. Locate valve boxes in ground cover/shrub planting areas instead of turfgrass areas whenever possible. Locate valve boxes 18” from and perpendicular to adjacent paving. When grouped together, provide equal spacing of at least 36" between boxes.

F. Permanently attach the plastic valve identification tag to the remote control valve body and locate so it’s clearly visible in an open valve box.

G. Permanently secure the control valve identification label to the top of the valve box lid with non-corrosive connectors.

3.6 AUTOMATIC CONTROLS

A. Program valve schedules appropriately for new planting.

B. The Owner shall review the fully functional operation of the irrigation control system prior to acceptance of the system, and as a requirement for the start of maintenance.

C. Install automatic controller chart in laminated or watertight plastic envelope inside controller cover showing which valves are connected to which stations on controller in the work area.

3.9 SPRINKLER HEAD INSTALLATION

A. Head spacing on drawings is diagrammatic. Head spacing and patterns shall be adjusted to provide complete and adequate coverage with a minimum spray on non-planted areas. Flush all lines prior to installation of heads.

B. Overhead distribution sprinkler heads shall be installed as detailed, set adjacent to the edge of hardscape elements (6 inches for spray heads, 12 inches for rotary heads) and perpendicular to the finish grade. Sprinkler heads shall be a minimum 2 feet, and preferably 3 feet (if planting layout permits) from building walls.

C. Where individual shrub bubblers are installed, each plant shall have a bubbler within 12 inches or less of the shrub rootball.

D. Upon completion of the installation, the Contractor shall adjust or change sprinkler head nozzles to uniformly distribute water without overspray and shall place entire irrigation system in first-class operating condition without any additional cost to the Owner.

E. Sprinkler heads shall be adjusted in order by fully opening the sprinkler furthest from the control valve and working back toward the control valve. Adjust sprinkler heads which spray toward buildings or adjacent hardscape so that water spray does not contact the side of buildings or significantly over-spray onto hardscape.

3.10 COMPLETION AND MAINTENANCE

A. After the system has been completed but prior to the start of maintenance, the Contractor shall operate the automated system with the Owner, shall instruct the Owner in the operations and maintenance of the system and controls, and shall program the controller for each station. If site central control system equipment is installed, the authorized central control distributor/installer shall program the central base station to communicate with the site control system, and shall verify that proper communication protocols are operational.

B. The irrigation system shall be maintained and adjusted as required to provide proper coverage throughout the maintenance period or until Final Acceptance of the project, whichever is greater. Irrigation system maintenance shall commence upon an acceptable review following the completion of irrigation installation, planting operations and general clean-up.

C. The maintenance period shall not terminate until the close-out documents and as-builts record drawings have been submitted and accepted.

3.11 REPAIR AND CLEAN-UP

A. All areas shall be maintained in a neat and orderly condition at all times. All reasonable precautions shall be taken to avoid damage to new planting and improvements. Disturbed and/or damaged areas shall be restored to their original condition to the satisfaction of the Owner.

B. Where trenching or other work disturbs newly planted turfgrass or planting, the Contractor shall reinstall the existing sod if viable, or install a full width of new turfgrass sod or planting to match the existing turfgrass/planting species/variety and size, after first conditioning the top 6 inches of soil per the Landscape Planting specification. Adjust finish grades to account for the new turfgrass sod's soil mat so that the new sod is flush to the adjacent turfgrass.

C. After the irrigation operations are completed, the Contractor shall remove all trash, excess materials, empty containers or any other debris accumulated by the work from the site. All damage caused by the work shall be repaired or material replaced at the Contractor's expense. The site shall be left in a neat and orderly condition to the satisfaction of the Owner.

END OF SECTION

SECTION 329000
LANDSCAPE PLANTING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The Contractor shall furnish all material, labor and equipment necessary to install all landscape work as indicated in the plans and specifications.

B. The landscape work includes but is not necessarily limited to the following:
1. Soil preparation including cross ripping of all planting soil.
2. Weed control including an application of a pre-emergent herbicide.
3. Providing import planting topsoil at raised grade planters and/or at planting areas needing fill.
4. Fine grading, conditioning and amending planting topsoil.
5. Installation of turfgrass sod.
6. Planting new trees, plants and ground covers.
7. Tree drainage sump boring and testing.
8. Installation of mulch.
9. Sixty (60) day maintenance.

C. Related Work Specified Elsewhere
1. Contract Drawings, Addenda, general provisions of the Contract, including General and Supplemental Conditions, and Division 01 Sections apply to work of this section.
2. Section 31 20 00 – Earthwork
3. Section 31 22 22 – Soil Materials
4. Section 32 01 90 – Existing Landscape Protection
5. Section 32 84 00 – Irrigation System

1.2 DEFINITIONS

A. Unless noted otherwise, the term "approved" shall mean by the Owner in writing.

B. Agencies and Organizations:
1. ASTM- American Society for Testing and Materials
2. ANSI – American National Standards Institute
3. ISA – International Society of Arborists
4. SSPWC – Standard Specifications for Public Works Construction, by the American Public Works Assoc./Associated General Contractors of California.
5. TPI – Turfgrass Producers International

C. Owner: The Owner’s authorized representative or authorized consultant.

1.3 QUALITY ASSURANCE

A. The work of this Section shall be performed by a single firm experienced in

landscape planting and holding a current California Contractor's A or C27 License.

B. Tree and plant quality and sizes shall conform to the current edition of "American Standard for Nursery Stock" for Number One nursery stock as adopted by the American Nursery & Landscape Association (ANSI Z60.1). Plants shall be of uniform, standard size for their listed container size, neither overgrown and root bound or encircling, nor so recently transplanted that the root system is not thoroughly well established throughout the container. Roots should reach the sides of the container and maintain a firm root ball. Pruning shall not be done prior to delivery except by prior approval.

C. Trees shall also comply with quality characteristics described in "Guideline Specifications for Nursery Tree Quality" current edition, published by the Urban Tree Foundation. Trees not in compliance with any of the following characteristics may be subject to removal and replacement, whether planted or still in their containers.
   1. Acceptable caliper and height ranges for the Type, Form and Size of tree.
   2. An intact central leader, or after heading of an old leader, the new leader diameter is greater than one-half the diameter of the old leader. Co-dominant leaders are not acceptable.
   3. Scaffold branch diameters are less than two-thirds the diameter of the trunk, and without included bark at the attachment.
   4. Scaffold branches shall be balanced, well spaced vertically, and with a radially blank section no greater than one-third of the canopy circumference.
   5. Temporary branches on the lower trunk shall be less than three-eighths inch diameter, and the clear trunk height shall be no more than forty (40) percent of the overall tree height.
   6. The root collar and rootball shall be free of defects, including circling, kinked and girdling roots. Roots at the edge and bottom of the container shall be less than one-quarter inch diameter, and uniformly distributed throughout the container.
   7. The tree canopy width shall be a minimum of twenty-five percent of the standard form tree height, except for naturally columnar forms.

D. Botanical names shall take precedence over common names. Provide plants that are true to name. Tag one representative plant of each species and size with the botanical name and size.

E. Inspection:
   1. All landscape work and materials shall comply with applicable Federal, State, County and City regulations.
   2. All plant material shall be reviewed onsite by the Owner's Representative and/or Landscape Architect prior to positioning and planting. Review shall not limit the right of rejection during any stage of the work until Final Acceptance for any reason including condition of the foliage or root ball, size, variety, form, appearance, latent defects or injuries. Rejected plants shall be removed from the site and replaced immediately by the Contractor at no additional cost to the Owner.

F. Qualifications of Workers
   1. Employ skilled workers who are thoroughly trained experienced in landscape planting and who are completely familiar with specified requirements and

methods needed for proper performance of the work in this section.

2. Provide adequate supervision by a qualified foreman fluent in English that will be continuously onsite during the performance of this work.
3. Weed control pesticides shall only be applied by an individual holding a valid Qualified Applicator Certificate (Category A) issued by the Department of Pesticides Regulation. Submit a copy of the Certificate.

G. Any pruning of existing trees specified as part of this Work shall be performed under the direct supervision of an ISA Certified Arborist and in compliance with ANSI A300-Part 1 Standard Practices (Pruning).

1.4 SUBMITTALS

A. In accordance with the Submittal section, submit:
1. A complete materials list of all items proposed to be furnished including estimated quantities.
2. Laboratory analyses of soil conditioning materials shall have been performed within one year of the submittal date.
3. Quality Certificates and/or Certificates of Inspection required by government agencies (providing duplicate copies for the Owner's Representative).
4. Qualified Applicator Certificate, and DPR Registration Certificates and Material Safety Data Sheets for all pesticides/herbicides proposed for use.
5. Submit photos with a scale marker of all boxed trees proposed for use from the nursery source. Photos shall clearly show the individual tree form without background greenery.

B. Soil amendments: Submit one (1) pint sample and an analysis of organic compost and mulch.

C. Other Samples: When requested by the Landscape Architect and/or Owner's Representative.

D. Soil Fertility Analysis and Recommendations:
1. The Contractor shall provide and pay for a fertility analysis of the existing topsoil and any proposed import planting topsoil. After mass grading operations are completed, native soil samples shall be collected for the fertility analysis by collecting a minimum of 5 representative samples of the soil per acre throughout the area of work. Separate samples shall be produced for cut and fill areas, and for any other area composed of soils not similar to the existing soils. Each sample shall be a minimum of one pint each, and shall be thoroughly mixed together to prepare a homogenous sample. A one quart representative sample for cut, fill and any other special conditions shall be submitted to the soil testing laboratory as a representative sample for fertility analysis. The fertility analysis shall at a minimum provide the following data:
a. soil texture class and percent sands, silts and clays per ASTM D422
b. estimated soil infiltration and percolation rates
c. pH
d. organic matter (%)
e. total soluble salts (ECe)
f. Cation Exchange Capacity (CEC) and Percent Cation Saturation for K,

Mg, Ca and Na

g. major and minor nutrients (ppm).

2. Recommendations for improvement of the soil conditions for optimum plant growth shall be made by the testing laboratory, and at a minimum shall include the following:
   a. A fertilizer and amendment application program (including macro and micro nutrients) for both pre-planting and maintenance fertility applications for broad area tillage and for planting pit backfill (pre-plant only).
   b. Treatments to neutralize soil pH and to correct any adverse conditions as warranted.
   c. Recommendations shall address soil conditioning for both planting area tillage and tree/plant planting pit backfill.
3. The soil analysis and recommendations shall be performed by one of the following laboratories capable of providing the above analyses by a licensed soil scientist:
   a. D&D Agricultural Laboratory. Contact Darrin Peters at 559-348-1818.
   b. Wilber-Ellis Company. Contact Michael Cline at 209-442-1220.
4. The Contractor shall submit the results of the soil testing investigations and shall receive written direction from the Landscape Architect before proceeding with any soil conditioning activities such as fertilizing and/or adding amendments.

E. Within seven days from the start of the maintenance period, submit a calendar of maintenance activities, including scheduled dates for mowing, fertilizing, weed control and all other activities. Provide the quantities of maintenance fertilizer and any other materials scheduled to be used in each application during the maintenance period.

F. Submit invoices and/or delivery tags from material suppliers for all amendments, fertilizer, seed, plants, mulch and any other materials provided for the landscape planting installation and applied during the maintenance period. Submit tags from seed packaging indicating seed varieties, percent purity and percent germination minimums. The invoices and/or delivery tags shall be provided directly to the Owner’s Representative/Inspector of Record within 24 hours of delivery to the site, as well as to the normal submittal recipients per the Contract Documents.

G. Close Out Documents: Submit prior to the start of the maintenance period, two bound copies of the following:
   1. Cover sheet stating Contractor's address and telephone number, duration of guarantee period, and a list of plant nurseries, materials and equipment vendors with names and addresses of the vendor/manufacturer representatives and warranty periods.
   2. A "CERTIFICATE OF CONSTRUCTION COMPLIANCE" which indicates that all work done, materials and equipment used and installed are in compliance with the approved plans, specifications and all authorized revisions.
   3. Maintenance Manuals and Instructions: Submit a monthly schedule of procedures to be established by Owner for maintenance of landscapes (trees, mixed planting and turfgrass) for one full year and shall include

recommendations for fertilizing, pest and disease control, mowing, aeration and top dressing.

4. Soil Amendment and Seed/Stolon Confirmation Form noting the installed quantities of materials and the person who confirmed the delivery and installation of the materials.
5. As-built Record Drawings with all modifications to the Drawings noted in red ink, and the Landscape Planting Observation Log completed.

1.5 AVAILABILITY

A. The Contractor shall confirm availability of plants, supplies, and materials prior to submitting his landscape bid. Plant variety substitutions are not desired.

B. If a plant is found not to be suitable or available, the Contractor is to notify Landscape Architect before bidding. The Landscape Architect is then required to select a reasonable alternate and to inform all those bidding of the availability of the original plant. If a substitute is selected it must be of the same size, value and quality as the original plant. Failure to inform the Landscape Architect of unavailable plants prior to bidding will require that all plants specified shall be provided by the Contractor at time of installation.

C. Plant container size listed on construction documents are minimum acceptable size. If plant material specified is not substituted prior to award of the contract the minimum container size specified shall be provided by the Contractor. If the Contractor can not provide the minimum specified size plant material at the time of installation, the Contractor shall be required to install a larger size container of the plant specified at no additional cost to the Owner.

1.6 EXISTING CONDITIONS

A. The Contractor is to visit the job site to verify existing conditions including soils, vegetative growth, subsurface conditions, existing grade and drainage, irrigation system etc. making allowances in his bid for any required work to provide the landscape installation as specified in the construction documents.

B. The Contractor shall notify the Owner to locate underground lines prior to hole boring or trenching. Do not permit heavy equipment such as trucks, rollers, or tractors to damage utilities. Hand excavate as required to minimize possibility of damage to underground utilities. Maintain grade stakes set by others until removal is mutually agreed upon by all parties concerned. Prevent damage to temporary risers of underground irrigation system and similar obstructing work located in the landscape areas.

C. If there is a conflict with existing utilities, improvements and/or planting and the proposed planting, Contractor shall promptly notify the Owner's Representative for instructions as to further action. Failure to do so will make Contractor liable for any and all damage or corrective actions arising from his operations.

D. Prior to the start of this work, the Contractor and the Owner’s Representative shall verify the operational condition of that portion of the existing irrigation system

pertaining to the proposed planting area. The Contractor shall notify the Owner's Representative of any repairs and/or corrections necessary for proper functioning and coverage. The repairs and/or corrections shall be completed before any plant material is planted. Failure to perform system verification and provide notification prior to the start of this work will make the Contractor liable for any and all repairs and/or corrections necessary for proper functioning and coverage, as well as any required plant replacement, without any additional cost to the Owner.

E. No plants shall be planted in situations that show poor drainage infiltration or low areas that result in standing water. Such situations shall be corrected by the Contractor as directed by the Landscape Architect or Civil Engineer. Failure by the Contractor to notify the Owner of poor drainage conditions prior to proceeding with the conditioning or planting operations shall place the responsibility for any plant removals, additional soil conditioning and replanting on the Contractor without any additional cost to the Owner. Any corrections of finish grading not in compliance with the Contract Documents including plant removal, soil conditioning and replanting shall be performed by the Contractor at no additional cost to the Owner.

1.7 PROTECTION

A. The Contractor shall guarantee repair of damage to any part of the premises resulting from but not limited to leaks, defects in materials or workmanship, operation of equipment, storage of materials and/or equipment, installation of underground or overhead utilities. The Contractor shall be liable for any and all accidents resulting from his work, including open holes and trenches during construction.

B. Protect new and existing landscape areas in the area of work from theft, loss, damage and deterioration during storage, installation and maintenance. Protect from unauthorized persons (trespassers) as well as from operations by other contractors and tradesmen, and landscape operations. Protect all planted turf and shrub areas from persons as well as operations of other contractors and the Owner. Cost of protection shall be born by the Contractor with means of protection such as temporary fencing as approved by Owner. Cost for protection shall be included in the Contractor's bid for the work.

C. Contractor shall repair or replace damaged work and/or damage to existing improvements/landscape as identified by the Owner's Representative to a condition acceptable to the Owner's Representative. No additional payment will be made to the Contractor for repair or replacement of damaged work and/or damage to existing improvements/landscape.

1.8 OBSERVATIONS

A. The Owner's Representative, Project Inspector or Landscape Architect shall perform periodic observations and shall record the observation on the Landscape Planting Observation Log form on the As Built Record Drawings. Such observations shall include but are not necessarily be limited to:
   1. Weed control operations prior to other portions of work.
   2. Ripping and soil conditioning of the planting area.

3. Layout of the plant material and trees at the site prior to planting in order to avoid conflicts and to meet the design intent.
4. Condition and quality of plant material prior to planting.
5. Auguring, digging and preparation of plant pits and drainage sumps for trees and shrubs.
6. Planting and staking of trees.
7. Planting of shrubs, ground cover and turfgrass.

B. Any corrective action called for shall be immediately performed by the Contractor.

C. Failure by the Contractor to obtain the above observations shall place the responsibility on the Contractor for any relocation and/or replacement of planted trees or shrubs.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Plant label shall identify each species and variety. A label shall be attached to each individual plant or block of identical plants grouped together.

B. Adequately protect plants from sun and wind prior to planting. Do not allow stored plant material to dry out at any time.

C. Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at the site. Store materials and equipment in a location as directed by the Owner's Representative.

1.10 PESTICIDE NOTIFICATION

A. A written notification of any and all pesticide/herbicide products scheduled for use by the Contractor or their representative on the Owner's property must be submitted to the Owner's Representative at least seven days prior to the scheduled application. Notification shall include the product name, manufacturer's name, the pesticide active ingredient, the U.S. EPA and CalDPR registration numbers, the scheduled date and application areas, and the reason (target species) for the application.

1.11 REPAIR OF DAMAGED EXISTING PLANTING AREAS

A. The Contractor shall be responsible to repair all damage and/or distress to existing planting areas including turfgrass, shrubs, ground covers, perennials, etc., whether specifically shown on the Contract Documents or not, as a result of construction operations, material and/or equipment storage, site access, site offices, utility and/or irrigation line installations or other actions.

B. Replacement shrubs shall be 15 gallon size, replacement ground cover and perennial plants shall be 5 gallon size, and turfgrass shall be full width sod. Damaged areas shall be amended and finish graded per the Contract Documents prior to planting. Non-turfgrass planting areas shall also receive wood mulch as

specified herein. The limits of repair shall be determined by the Owner.

1.12 SEASONAL REQUIREMENTS FOR TURFGRASS SEED / STOLON PLANTING

A. Warm-season turfgrass seed /stolon planting shall be performed between May 1 and August 1. Any turfgrass seed application outside of the above period shall be an approved cool-season turfgrass variety, blend or mix and shall be temporary until the permanent warm-season turfgrass can be planted.

B. Contractor may at his own risk plant warm-season turfgrass seed/stolons after August 1. However, if the warm-season turfgrass does not adequately germinate and develop into a full stand of grass within forty-five (45) days to the satisfaction of the Owner and Landscape Architect, the Contractor shall be responsible for overseeding with an approved cool-season turfgrass, and shall also maintain the cool-season turfgrass and reinstall the warm-season turfgrass after May 1 of the following year per Subsection C below at no additional expense to the Owner.

C. If a warm-season turfgrass is originally specified but a cool-season variety, blend or mix is temporarily installed outside of the above planting period, the Contractor shall perform the following work at no additional expense to the Owner.
   1. Maintain the temporary cool-season turfgrass for ninety (90) days per Subsection 3.16.
   2. Return to the project site during the warm-season planting period, and provide worker sanitary facilities if not available.
   3. Prepare topsoil samples and provide a soil fertility analysis as described in 1.05, E.
   4. Perform two cycles of herbicide removal of the cool-season turfgrass, and remove the resulting organic debris.
   5. Aerate the topsoil with slicing tines to a minimum depth of six (6) inches. Make a minimum of two passes, each in a perpendicular direction.
   6. Apply fertilizer and conditioners to the topsoil as recommended by the soil analysis and approved by the Landscape Architect.
   7. Finish grade and prepare topsoil for seed / stolons.
   8. Apply the warm-season turfgrass seed / stolons at specified rates per Subsection 3.12.
   9. Maintain the newly established warm-season turfgrass for ninety (90) days per Subsection 3.16.

PART 2 - PRODUCTS

2.1 TOPSOIL

A. Topsoil used in planting areas shall be a clean, friable soil with no noxious weeds, clods or stones larger than 0.5 inch in diameter, subsoil, hardpan, wood, debris, fine organic material greater than 5%, undesirable insects, plant disease or any other natural or extraneous objects detrimental to normal plant growth to a minimum depth of 18 inches from finish grade.

B. The Contractor shall provide a particle size analysis, fertility testing and

amendment recommendations of proposed native and/or import topsoil, and the Landscape Architect reserves the right to reject topsoil not conforming to the minimum specifications. Stockpiled onsite topsoil may be used if analysis and testing determines compliance with these requirements prior to placement. Failure to meet minimum specifications shall result in the removal of any unauthorized placed topsoil at the Contractors expense.

C. Particle size distribution for topsoil shall meet the following per ASTM D422:
   1. 100% passing a 12.2 mm (1/2”) screen.
   2. Minimum 95% passing a 9.5 mm (3/8”) screen.
   3. Minimum 75% passing a 2.36 mm (No. 8) screen.
   4. Maximum 45% passing a No. 200 screen.
   5. Silt content shall be a maximum 35%.
   6. Clay content shall be a maximum 25%.
   7. Silt to Clay ratio shall be less than 2 and greater than 0.5.

D. Other characteristics shall conform to the following:
   1. Permeability rate shall be not less than one (1.0) inch per hour or not more than 20 inches per hour.
   2. The sodium absorption ratio (SAR) shall not exceed 3.0 and the electrical conductivity (ECe) shall not exceed 2.5 milliohms per centimeter at 25 degrees centigrade.
   3. Soluble boron shall be no greater than 1.0 part per million (mg/l).
   4. Soil pH range shall be 6.5 – 7.9.
   5. Maximum concentration of soluble chloride shall be 150 parts per million.
   6. Maximum concentration of heavy metals shall not exceed the following when the pH is between 6 and 7:
      a. Arsenic: 0.5 ppm
      b. Cadmium: 0.5 ppm
      c. Chromium: 5 ppm
      d. Cobalt: 1 ppm
      e. Lead: 15 ppm
      f. Mercury: 0.5 ppm
      g. Nickel: 2.5 ppm
      h. Selenium: 1.5 ppm
      i. Silver: 0.25 ppm
      j. Vanadium: 1.5 ppm
   7. Petroleum hydrocarbons shall not exceed 100 mg/kg dry soil.
   8. Aromatic volatile organic hydrocarbons shall not exceed 2 mg/kg dry soil.

2.2 SOIL AMENDMENTS

A. Organic Compost: “Harvest Premium” as supplied by Harvest Power (559) 435-1114; “WonderGrow Compost” by Grover, Inc. (866) 764-5765, or “Allgro Compost” by Synagro (559) 341-5158, and conforming to the following minimums:
   1. Certified as “Mature” or better per the California Compost Quality Council Maturity Index.
   2. Pass EPA Class A standards for pathogens and heavy metals.
   3. Particle size: 1/8" maximum.
   4. pH: 6.5-7.5.

5. Macro-nutrients: Minimum of 1.0% Nitrogen, 0.5% Phosphorus, 0.5% Potassium.
6. AgIndex ratio greater than 2.
7. Organic matter content greater than 25% dry weight.
8. Carbon/Nitrogen ratio: less than or equal to 25.
9. Salinity (ECe): less than 5.0 dS/m.
10. Odor shall be soil-like (musty or moldy) without any sour, ammonia-like or putrid smell.

B. Gypsum shall be mined agricultural grade gypsum composed of no less than 100% $CaS0_4$-$2H_20$ hydrated calcium sulfate in a pelletized form. Elemental Sulfur shall be a minimum 95% pure agricultural grade.

C. Dry Humate organic soil conditioner comprised of 70% humic acid from Leonardite.

D. Endo 120 Mycorrhizae containing a minimum 60,000 living propagules per pound.

E. Amendment material types and application rates may be subject to change based on the findings and recommendations of the horticultural soil testing lab, and as such may result in an increase or decrease in the Contract Amount.

2.3 FERTILIZER

A. Trees and Shrubs: Fertilizer for all trees and shrubs to be BEST PAKS (20-10-5) controlled release fertilizer in a biodegradable 10 gram packet. The BEST PAKS shall be applied at the following rates:
1. 1 Gallon Can: 1 Best-Pak
2. 2 Gallon Can: 2 Best-Paks
3. 5 Gallon Can: 5 Best-Paks
4. 15 Gallon Can: 10 Best-Paks
5. 24” Box: 16 Best-Paks
6. 36” Box: 24 Best-Paks

B. The pre-plant fertilizer shall be a commercial homogeneous, granular pellet:
1. Pre-plant fertilizer for turfgrass shall be:
   a. BEST 6-24-24-5S XB+ with Avail
2. Pre-plant fertilizer for mixed plantings shall be:
   a. BEST Landscape Color 14-14-14 (14-6-11.6-3S and micronutrients) with 9.9% slow release N, or equal.

C. The maintenance fertilizer shall be a commercial homogeneous, granular pellet:
1. Maintenance fertilizer for turfgrass shall be one or more of the following:
   a. Urea 46-0-0
   b. BEST Ammonia Sulfate 21-0-0-24S, standard grade, or equal
   c. BEST Nitra King 21-2-4-14S-2Fe, or equal.
   d. BEST Nitex 20-2-3-12S-5Fe, or equal.
   e. BEST Polyon 43 (43-0-0) slow release N, or equal.
   b. Wil-Gro Pro Choice Plus, 31-3-7-6S-3Fe with 9.3% slow release N, or

equal.

b. Best Landscape Color 14-14-14 (14-6-11.6-3S and micronutrients) with 9.9% slow release N, or equal.

2. Maintenance fertilizer for mixed plantings shall be the pre-planting fertilizer. Use slow release above for one time fertilization.

D. Fertilizer material types and analysis may be subject to change based on the findings and recommendations from the horticultural soil testing lab, and as such may result in an increase or decrease in the Contract Amount.

2.4 MULCH

A. Mulch for on-grade or raised native soil planters shall be a walk-on type of chipped and aged greenwaste woody material without leaves, green wood, sticks, dirt, stones, dust and other non-organic debris as accepted by the Landscape Architect. Particle size 1/2” to 3" in general size.

2.5 STAKING & GUYING MATERIALS

A. Stakes: 2" Diameter lodgepole pine, pressure treated and pointed one end.

B. Ties: V.I.T. Cinch Tie, 32 inches long, V.I.T. Products, Inc. (619) 673-1760, or equivalent.

2.6 PLANTS

A. Plants shall be typical of their species and variety, shall have normal growth habits, well developed branches and be densely foliated, and shall have fibrous root systems. No substitutions will be allowed unless approved in writing by the Landscape Architect.

B. Plants shall be free from defects and injuries including disease, insects, insect eggs and larvae and girdled or matted roots.

C. Quality and size of plants shall be in accordance with ANSI Z60.1-2004, "American Standard for Nursery Stock", and as described in Quality Assurance.

D. Plants shall not be pruned before planting.

E. Plant material must be selected from nurseries that have been inspected by State or Federal Agencies.

F. Plants shall be nursery grown and shall have been transplanted or root pruned at least once in the past three (3) years. Plants shall have been grown under climatic conditions similar to those in the locality of the project.

G. Each bundle of plants shall be properly identified by weatherproof labels securely attached thereto before delivery to the project site. Label shall identify plant by name.

H. Nomenclature shall be in accordance with Sunset Western Garden Book, current edition.

I. No plants shall be removed from their container until a review has been made in the field or at the nursery, or except when specifically authorized in writing by the Owner.

J. Collected plant material may be used only when approved. Approval shall not limit the right of rejection during work progress for conditions of the root ball, latent defects or injuries.

K. Where shown a "MULTI" provide trees with a minimum of three trunks.

L. Plant sizes listed on the planting plan are minimum acceptable sizes. The quantities listed are the Landscape Architect's estimate only. The Contractor is responsible for the quantities of plant symbols shown on the plan, and/or the quantities in hatched planting areas at the specified triangular spacing.

2.7 TURFGRASS SOD

A. Sod shall be produced from certified or approved seed/stolons, fresh and labeled in accordance with U. S. Department of Agriculture Rules and Regulations. Sod quality shall be Premium or Standard Grade per TPI specifications. Harvested sod shall be big roll size.

B. Sod shall be neatly mowed and be mature enough that when grasped at one end it can be picked up and handled without damage, delivered to the project site, adequately protected and installation commenced within 24 hours of harvesting.

C. Turfgrass shall be a species and variety as specified in the Contract Drawings. If a warm-season grass is specified and the installation is to be performed between the months of October and April, a species with an established perennial ryegrass overseeding shall be installed. Submit the overseeded product information for approval prior to the installation.

2.8 TURFGRASS SEED

A. Seed shall be delivered in original unopened containers with legible identification labels. Store in a shaded and dry location protected from weather or damage.

B. Seed shall be from a Certified source, hulled and coated, and shall be a species and variety as specified in the Contract Drawings.

C. Warm-season Bermudagrass seed shall be a one of the following improved blends:
   1. “La Prima” by Seed Research of Oregon. Available from Horizon in Fresno (559) 431-8007.
   2. “Bermuda Triangle” by Pennington Seed. Available from Wilber-Ellis (916) 991-4451; or Western Farm Service (559) 686-3375.

D. Cool-season turfgrass for temporary seeding or overseeding shall be a blend of annual and perennial ryegrass, “SOS 211” by Barenbrug USA or equal. Available from Valley Seed (559) 225-7333.

2.8 TREE TRUNK PROTECTOR

A. ArborGard+ polyethylene tree guard by Dimex (800) 334-3776, or equal.

2.9 HERBICIDES

A. Herbicide products for removal of unwanted grass and broad-leafed weeds shall be registered and approved for use by the U.S. EPA and CalDPR, and shall comply with the Owner’s Standards and with the “Healthy Schools Act” with current amendments.

B. Provide pre-emergent and post-emergent, selective herbicide formulations for use on turfgrass areas and/or ornamental shrub/ground cover areas that are not injurious to the proposed plantings and turfgrasses.

C. Provide a non-selective contact herbicide formulation for use on existing established weeds.

2.10 OTHER MATERIALS

A. Materials not specifically indicated, but necessary for proper execution of the work, shall be of first quality as selected by the Contractor subject to approval of the Landscape Architect.

PART 3 - EXECUTION

3.1 EXAMINATION & PREPARATION

A. General: Verify that existing site conditions are as specified and indicated before beginning this work.

B. Damaged Earth: Verify that earth rendered unfit to receive planting due to concrete water, mortar, limewater, hydrocarbons or any other contaminant dumped on it has been removed and replaced with clean earth from a source approved by the Owner’s Representative.

C. Examine the area and conditions under which the work in this section is to be performed. Verify that any existing irrigation system within the limit of work is in proper working order with full coverage. Correct conditions detrimental to the

timely and proper completion of the work. Do not proceed until unsatisfactory conditions have been corrected. Commencement of the work signifies acceptance of the existing conditions.

D. Protection:
   1. Locate sewer, water, irrigation, gas, electric, phone and other pipelines or conduits and equipment within the area of work prior to commencing work.
   2. Mark existing irrigation heads, valves, valve boxes and other below grade equipment or components that are scheduled to remain. Protect in place.

E. Runoff and Erosion Control: Furnish equipment, materials and labor necessary to control the flow, drainage, and accumulation of excess water running off the work area and prevent soil erosion, blowing soil and accumulation of wind-deposited material on the site per the approved SWPPP.

3.2 ROUGH GRADING, SOIL PREPARATION, PLANTER BACKFILL

A. Rough grading shall be performed by other subcontractors to the extent of establishing rough pads, slopes and drainage patterns. The Contractor is responsible for placement of topsoil and grading required to ensure positive drainage in all turfgrass and planting areas. All planting areas shall have a minimum topsoil depth of 18 inches from on-site native and/or approved import sources. Rough grading shall be completed prior to weed control, cross ripping or rock removal operations.

B. After the completion and acceptance of the weed control operations outlined below, and unless directed otherwise by the Landscape Architect or noted on the Drawings, and except for the area under the canopy of existing trees, the Contractor shall cross rip and till (break up large clumps and clods in excess of 2 inch diameter) the existing soil within all planting areas outside the canopy drip line of existing trees until the soil is loose and friable. Ripping shall be to a minimum depth of twelve inches (12") in turfgrass areas and eighteen inches (18”) in shrub/ground cover areas, with ripping tines a maximum 18” apart performed in a minimum of four passes total in different directions (perpendicular and diagonal). The Contractor shall review the completed ripping operation with the Owner’s Representative and Landscape Architect to determine compliance. The first 6 inches of any new topsoil fill shall be tilled into the existing soil to a minimum depth of 6 inches prior to placing any further topsoil fill. The Contractor shall provide any additional work as directed by the Owner’s Representative after the review to obtain compliance. Do not proceed with the addition of topsoil and/or amendments, or commence rock picking or fine grading until the completed ripping operation is accepted in writing by the Owner’s Representative.

C. Planting area soil under the canopy drip line of existing trees, or in planting beds not accessible by motorized equipment, shall be ripped to a minimum depth of 12 inches using manual spading shovels, forks and/or broadforks and working around major tree roots and/or utilities. In areas receiving new mulch, rip to a minimum depth of 4 inches while protecting any existing plants and their root system. Break up and/or remove rocks and clods as indicated below.

D. Do not work soil when moisture content is so great that excessive compaction will

occur, or when it is so dry that dust will form in air or clods will not break up readily, or when a full ripping depth cannot be achieved. Apply water, if necessary, to bring soil to an optimum moisture content for tilling and dust control. Maintain within 2 percent above or below optimum moisture content for the existing soil type at all times during the work.

E. After soil ripping and preliminary finish grading is completed, the topsoil shall be cleared of all concrete, wire, sticks, roots, debris and foreign materials. Remove native stones and clods as follows:
   1. In shrub/ground cover areas, remove stones and clods greater than one (1.0) inches in diameter from the top 3 inches of finish grade.
   2. In general, non-traffic turfgrass areas, remove stones and clods greater than three-quarter (0.75) inch in diameter from the top 3 inches of finish grade.
   3. In designated play or sports field turfgrass areas, remove stones and clods greater than one-half (0.50) inch in diameter from the top 4 inches of finish grade using a mobile tractor pulled, PTO powered, hydraulic controlled rock picker, Cherrington Model 4500 or similar.

F. Add clean planting topsoil where needed to bring grade to elevation to promote positive drainage. Spread approved planting topsoil over ripped subgrade prior to incorporating amendments.

3.3 WEED CONTROL

A. Weed control pesticides shall only be applied by an individual holding a valid Qualified Applicator Certificate (Category A) issued by the Department of Pesticides Regulation.

B. The Contractor shall treat any weeds in proposed new turfgrass and planting areas with a post-emergent contact weed killer at manufacturer's approved rates prior to any commencement of work at the site including any irrigation work, ripping of soils or fine grading.

C. Weed eradication shall be ongoing throughout the course of the landscape installation. The Contractor shall apply a pre-emergent herbicide after shrub/ground cover planting and prior to mulch installation. Manually remove weed seed heads. At no time will weeds be allowed to become established. Contractor shall provide all weed control operations as directed by the Owner’s Representative.

D. All weed control operations using pesticides/herbicides shall comply with the CalDPR and Owner Standards. The Contractor shall comply with the notification and posting requirements of the “Healthy Schools Act”.
   1. The Contractor shall notify the Owner per Subsection 1.11, A.
   2. The Contractor shall post highly visible signs around the treatment area in conformance with the “Healthy Schools Act” warning of a scheduled pesticide/herbicide application a minimum of 24 hours before to 72 hours after a pesticide application.

E. Just prior to turfgrass installation, and/or after the shrub/ground cover planting is

complete and prior to mulch installation, apply an approved pre-emergent herbicide per the manufacturer's recommended rates.

3.4 SOIL CONDITIONING

A. Before commencement of any soil conditioning, weed and rock removal shall be completed as outlined above.

B. Uniformly amend the entire area of topsoil in turfgrass and mixed planting areas per the following bid rates and per the approved modifications as a result of the soils analysis recommendations:
   1. Turf and Non-Sloped (less than 4h:1v) Planting Area Soil Conditioning (per 1,000 square feet).
      a. Compost at a rate of six (6.0) cubic yards (a 2.0 inch thick layer).
      b. Gypsum at a rate of 100 pounds, or Sulfur at 19 pounds, or an equivalent combination.
      c. Humate soil conditioner at a rate of thirty (30) pounds.
      d. A pre-planting fertilizer to turfgrass areas at a rate of 1.25 pounds of actual P and K.
      e. A pre-planting fertilizer to mixed planting areas at a rate of 1 pound of actual N.
      f. Endo 120 per Subsection 3.06, Mycorrhizae Application.

C. Till soil amendments into the entire planting area soil to a minimum depth of six (6) inches. Perform the cultivation in at least two passes, one in each perpendicular directions to the first, so that the amendments are homogeneously incorporated into the topsoil. All cultivation inside the dripline of existing trees shall be preformed manually with minimal disturbance to the root system.

D. Planting backfill for trees and shrubs shall be a mix of four-fifths native soil and one-fifth Compost by volume. Add Humate and Endo 120 Mycorrhizae at 5 pounds each per cubic yard of backfill.

E. Amendment material types and application rates may be subject to change based on the findings and recommendations of the horticultural soil testing lab, and as such may result in an increase or decrease in the Contract Amount.

3.5 FINE GRADING

A. Upon completion of soil preparation, fine grade all planting and turfgrass areas to a smooth and even slope conforming to and establishing drainage patterns per the approved Grading Plan. Grading shall eliminate all humps and hollows and promote positive drainage in all planting and turfgrass areas.

B. Where hardscape is installed in existing planting areas, a minimum transition grade width of 2 feet adjacent to the edge of hardscape shall be constructed unless noted otherwise. The maximum slope of any transition grade shall be 20 percent. The area of transition grading shall be planted or repaired as specified herein.

C. Tolerance of grade differential for planting and general turfgrass areas shall be plus or minus 0.04 foot. If requested, the Contractor shall water test all turf and planting areas after the grading operations are completed in the presence of the Owner's Representative and Landscape Architect. The water test shall consist of applying water to the turf and planting areas to the point where water begins to run over the soil to show the drainage pattern. Make all corrections to the finish grading as required by the Owner's Representative to re-established positive drainage patterns. Acceptance of the finish grading shall be obtained in writing from the Owner's Representative and Landscape Architect prior to proceeding with soil conditioning and planting operations.

D. Turfgrass sports fields shall be fine graded using a laser controlled machine capable of producing final grades within 0.02 foot plus or minus from the proposed elevations.

E. After the finish grading process, relative compaction of the soil in turf and planting areas shall range between 82% and 85% relative density. Compaction/moisture levels are generally acceptable if an Oakfield probe is able to penetrate a minimum of six inches into the cultivated planting topsoil with moderate pressure. The Owner reserves the right to require the Contractor to test for over compaction. If the compaction is within the acceptable range, the test will be paid for by the Owner. All testing due to non-compliance will be paid for by the Contractor.

F. Remove all rocks produced as a result of the soil conditioning and finish grading operations per the requirements of Subsection 3.02.

G. Finish grades shall be one-half inch (1/2") to three-quarter inch (3/4") for turfgrass sod areas, flush (0.0") for turfgrass seed/stolon areas and two inches (2") for shrub/ground cover planting areas below the finish surface of all adjacent walks, curbs, mowstrips and utility/valve boxes or collars. Transition any grade modification in existing planted areas at a maximum 12h:1v slope to existing grade, unless shown otherwise on the grading plan.

3.6 MYCORRHIZAE APPLICATION

A. In turfgrass planting areas, after fine grading is completed broadcast Mycorrhizae at a rate of one and one half (1.5) pounds per 1,000 square feet (65 lbs. per acre). Lightly rake into the top one inch (1") of topsoil immediately prior to turfgrass installation.

B. In shrub and/or ground cover planting areas, the Mycorrhizae inocculant shall be incorporated into the soil with the other soil amendments at three (3.0) pounds per 1,000 square feet (130 lbs. per acre) per Subsection 3.04, Soil Conditioning. Innocculant shall also be incorporated into the planting backfill per Subsection 3.04, E.

3.7 PLANTING

A. General Requirements
   1. Obtain written approval from the Landscape Architect or Owner's Representative to begin planting operations. The irrigation system shall be fully automated and operational, all weeding, soil conditioning and finish grading completed, and the tree and plant layout approved.
   2. Planting shall be performed by workmen familiar with planting procedures and under the supervision of a qualified foreman. The planting foreman shall be on the job site al all times when planting is in progress.
   3. Planting operations shall not occur under unfavorable weather conditions.
   4. Boxed trees shall be planted first. Shrub planting shall be completed before groundcover is planted.
   5. Proceed and complete the landscape work as rapidly as portions of the site become available, working within the seasonal limitations for each kind of planting required.
   6. Cooperate with other contractors and trades working in and adjacent to the planting work areas. Examine drawings which show the development of the entire site and become familiar with the scope of other work required.

B. Planting Preparation and Operations
   1. Planting material shall be provided with adequate protection of root system and balls from drying winds and sun. Do not bend or bind trees or shrubs in such a manner as to damage bark, break or destroy natural shape. Provide protective covering during delivery.
   2. Deliver trees and shrubs after preparations for planting have been completed, and plant immediately. If planting is delayed more than six (6) hours after deliver, set trees and shrubs in shade, protect from weather and mechanical damage and keep roots moist. Do not remove container grown stock from containers until planting time.
   3. All planting areas shall be smooth and even. Finish grades shall be done prior to any placement of plants.
   4. Place all trees and shrubs in locations shown on the planting plan and obtain written field approval of the Landscape Architect before planting or digging planting pits. Inform the Landscape Architect seven (7) days prior to placing the plants. Maintain a minimum 15 foot clearance from trees to any light pole, unless specifically noted otherwise.

   5. Carefully remove all canned stock from containers with tin snips or approved cutter. Cut away and remove any girdled or matted roots.
   6. Excavate holes of circular outline with vertical sides for all plants 15 gallon or less. Boxed trees shall have square planting holes. The vertical sides and bottom of the holes shall be thoroughly scarified to promote union of backfill with existing soils. All trees shall have two drainage sump holes drilled with a twelve inch (12") diameter auger penetrating hardpan layers to a minimum one (1) foot into a sand/gravel layer or to a minimum depth of ten (10) feet below the planting pit bottom. Precautions shall be exercised to avoid smooth sides on the holes. Offset augured holes a minimum of eighteen inches (18") from planned tree location to avoid settling of tree after planting.
   7. After cleaning out the sump holes, the Contractor shall test the sumps for drainage by flooding with water. If the water does not drain out within twenty-four (24) hours, auger down as required to achieve such drainage by breaking through the hardpan layer, or by extending the drainage sumps to a

minimum depth of 15 feet below the bottom of the planting pit. After obtaining approval of the sump holes, fill the augured drainage sump holes with coarse concrete sand.

8. Tree and shrub planting pits shall be at least two and one half (2.5) times the width of the plant container, but a minimum of 36” wide for trees and 18” wide for container shrubs. Planting pits shall be as deep as the soil depth in the container or box, less the additional height of the crown above the finish grade.
9. Set each plant in the center of the pit, plumb and straight. Set the crown of the plant at one inch (1") for shrubs, two inches (2”) for trees above finish grade. When 1/2 of the backfill mix has been placed, tamp-in, insert fertilizer (BEST PAKS as per Section 2.1B1) and allow no air pockets as remainder of backfill is added.
10. Compact soil around the rootball of all plants and thoroughly water in the entire backfill depth.
11. Excess soil from plant holes shall be cultivated and raked to a smooth outline.
12. Shrubs and groundcovers shall be installed in relation to walks and paving to allow for future growth without obstructing traffic with clearance as shown on the drawings.
13. All plants shall be set in watering basin which shall be as wide as the planting pit, but at least four feet (4') in diameter and four inches (4") deep for trees and two feet (2') in diameter and three inches (3") deep for shrubs and vines.
14. Ground cover plants shall be planted at the spacing noted on the drawings. Not more than fifteen minutes shall elapse from the time any groundcover plant is planted until it is watered.

C. Pruning: Prune plants in accordance with established horticultural practice. Shearing of any plants will not be acceptable. Tree pruning shall only be performed with the written approval of the Landscape Architect and under the direction of a certified arborist, and shall comply with ISA Pruning Standards (ANSI 300).

3.8 MULCH

A. Prior to any mulch application, perform weed control operations as specified herein.

B. Where mulch is to be installed in an existing planting area, breakup/till the existing soil in open areas around existing plantings to a minimum 4” depth per section 3.02, and adjust finish grade adjacent to hardscape elements per section 3.05 where not prohibited by existing plantings.

C. Install a minimum 3” layer of mulch in all non-turf planting areas, except for slopes greater than 3h:1v and seeded areas. Install a minimum 2” layer of mulch in all areas receiving flatted plants.

D. Install a minimum 3” layer of wood mulch at a minimum 3’ radius from the tree trunk of all trees located in turfgrass areas. Provide a smooth finish grade transition to a 2 inch depth where the mulch meets the turfgrass, so that the top elevation of the mulch is flush to the turfgrass soil. Keep mulch off the trunk. For

new trees in turfgrass areas, remove the watering berm just prior to the turfgrass planting but maintain the mulched area within the planting pit.

3.9 STAKING & GUYING

A. Trees shall be supported by two (2) tree stakes as shown on the drawings. Cut off the top of stakes damaged by installation or where the stake conflicts with canopy branches.

B. Stakes shall be set firmly in the ground outside the rootball and where possible set stakes perpendicular to the prevailing northwest wind.

C. Trees shall be tied to upright stakes loosely with tree ties (see planting detail). Remove the nursery stake.

D. Multi-trunked trees shall be guyed, or individual branches may be staked and loosely tied as shown on the Drawings.

3.10 ARBOR GUARD

A. Install ArborGard+ on all newly planted tree trunks in turfgrass areas per manufacturer's recommendations.

3.11 TURFGRASS SOD

A. The area to be planted shall be finish graded to present a smooth and even surface free of humps and hollows and conforming to the finish grading plans. Where new sod is abutting existing turfgrass, fine grade to allow for the thickness of the new sod soil so that the new and existing sod grades are flush. Immediately prior to planting, the surface of the area to be planted shall be sufficiently loose and friable, with adequate moisture to receive the sod. Avoid laying sod on hot or dry soil.

B. Lay first strip of sod slabs along a straight line (use a string in irregular areas). Butt joints tightly. Do not overlap edges. On second strip, stagger head joints (similar to a running bond brick pattern). Use a sharp knife to cut sod in order to fit curves, edges, and sprinkler heads.

C. Install with turf-tired machinery full width sections sod as delivered and flush to adjacent surfaces. Terminating sod edges shall be straight and at right angles to hardscape elements whenever possible.

D. As the sod is being installed, water the sod lightly to prevent drying out. Continue to lay sod and lightly water until installation is complete.

E. After laying sod, roll to eliminate irregularities and to form good contact between sod and soil. Avoid a too heavy roller or excessive initial watering which may cause roller marks.

F. Water the completed lawn surface thoroughly. Topsoil should be constantly moist for a minimum two inches deep. Repeat irrigating at regular intervals to keep sod moist until rooted. The areas shall not be watered to the extent of saturating the soil and causing "flotation" or "flowing" of the top surface of the soil. After water has once been applied, no portion of the planted areas shall be allowed to dry out during the entire maintenance period. After sod roots are established, decrease frequency and increase amount of water per application as necessary to maintain good soil moisture to a minimum 6” depth without standing water or excess runoff. The Contractor shall be responsible to monitor the site and alter the watering times and frequencies to meet site and climatic conditions.

G. Prior to the start of the maintenance period, fill all seam joint gaps greater than 1/8 inch and less than 0.5 inch with washed concrete sand. Fill any joint gaps of 0.5 inch or greater width with a minimum two foot long replacement sod section in order to achieve a tight joint.

H. Replace dead or distressed sod with equivalent material as directed by the Landscape Architect.

I. Do not install turfgrass inside the watering basin of new trees planted in turf areas, or within a 3’ radius of existing tree trunks located in turf areas.

3.12 CLEAN-UP AND REPAIR

A. All areas shall be maintained in a neat and orderly condition at all times. All reasonable precautions shall be taken to avoid damage to existing planting and structures. Disturbed and/or damaged areas, whether a part of this work or from the work of other trades, shall be restored to their original condition.

B. Plants and/or turfgrass shown to remain and damaged or removed by construction operations and/or utility/electrical/drainage lines shall be replaced with plants that match as closely as possible to the existing plant species, variety and size. The replacement turfgrass sod variety shall be the same as shown in the Planting Legend if for new work, or shall match the existing turfgrass variety where the turfgrass is existing. Adjust the finish grade so that the new turfgrass sod abuts flush to the existing turfgrass or to hardscape. The replacement plants and/or turfgrass sod shall be maintained as part of the original scope of work.

C. After the planting operations are completed, the Contractor shall remove all trash, excess soil, empty containers or any other debris accumulated by the work from the site. All damage caused by the work shall be repaired at the Contractor's expense and the site shall be left in a neat and orderly condition to the satisfaction of the Owner.

3.13 TURFGRASS SEED

A. Complete soil conditioning operations and irrigation system installation prior to seeding. At the time of seeding, the surface of all areas to be seeded shall be free of large stones, sticks, stumps, or other deleterious matter one inch in diameter or larger, and shall be free from all wire, plaster, construction debris of any kind, or

similar objects that would be a hindrance to seeding or maintenance.

B. Maintain adequate soil moisture for seed germination and establishment. Use the cycling (multiple start) feature of the irrigation controller to prevent run-off.

C. Warm-season turfgrass seed shall be planted at not less than 1/8 inch and no more than 1/4 inch depth at 4.0 pounds per 1,000 sq. feet.

D. Warm-season turfgrass seed may only be planted when minimum soil temperatures are above 65 degrees F throughout the germination period.

E. Cool-season turfgrass seed shall be planted at not less than 1/4 inch and no more than 1/2 inch depth at 9.0 pounds per 1,000 sq. feet (3.0 lbs/ 1,000 sq. ft. in each of three directions, the second and third perpendicular and diagonal to the first).

F. Cool-season turfgrass seed may only be planted when soil temperatures are above 55 degrees F and below 85 degrees F throughout the germination period.

G. Seed may be applied by drill seeding. If drill seeding, apply one-half of the total quantity of seed required in two different applications in perpendicular directions, e.g. north-south, and east-west. If applying the seed by hydroplanting, add to the slurry the following:
   1. Environ Fiber S-100 mulch, or equal at 1,500 lbs. per acre.
   2. Ecology Controls M-Binder, or equal at 80 lbs. per acre.

H. Protect the seeded area from disturbance (including erosion) and pedestrian traffic with barriers acceptable to the Owner. The Contractor is responsible to repair and reseed any disturbed or damaged areas.

I. Reseed bare areas failing to adequately germinate a uniform density of plants within 14 days after the scheduled germination. The Landscape Architect shall be the sole judge of adequate uniformity and density. The Contractor shall reseed and/or correct any deficiencies until the acceptance of the seeded area by the Landscape Architect and Owner's Representative.

J. Do not install turfgrass seed inside the watering basin of new trees planted in turf areas, or within a 3' radius of existing tree trunks located in turf areas.

3.14 PRE-MAINTENANCE REVIEW

A. A general review will be held prior to the start of the maintenance period upon conclusion of the planting operations, irrigation system installation and after clean-up has occurred. The Owner's Representative shall be informed in writing a minimum of seven (7) working days prior to the time the work is ready for review in order to arrange a suitable time and date for such review.

B. At the time of review, Contractor shall have all planting areas free of weeds and neatly cultivated and fine graded. All plant basins shall be in good repair. All trees shall be properly staked and tied. All turfgrass areas shall be fully established and have a healthy, uniform and dense stand of grass without weeds or bare spots.

C. Work requiring corrective action or replacement in the judgment of the Owner's

Representative shall be performed within five (5) days after the inspection. Corrective work and materials replacement shall be in accordance with the drawings and specifications and shall be made by the Contractor at no cost to the Owner. A subsequent review shall then be arranged.

D. If after the review, the Landscape Architect is of the opinion that all the work has been performed as per the Contract Documents, and a uniform stand of healthy dense turfgrass has been established without weeds or bare spots, the Contractor will be given written notice that the maintenance period may begin.

3.15 MAINTENANCE - GENERAL

A. After all work indicated on the drawings or herein specified has been completed, reviewed, and approved, and the turfgrass has been successfully established per the requirements below, the Contractor shall commence a sixty (60) calendar day maintenance period in which the Contractor shall continuously maintain all areas included in the contract during the progress of the work and throughout the maintenance period, or until Final Acceptance of the project, whichever is greater.

B. Maintenance work includes monitoring the site to control all watering, replanting, fertilizing, mulching, weeding, cultivating and mowing necessary to bring the planted areas to a healthy and vigorous growing condition, and any additional work needed to keep the areas neat, edged, weed and trash free, and attractive.

C. All trees, shrubs, ground cover shall be kept at optimum growing condition by watering weeding, replanting, fertilizing, cultivating, tree stake repair, spraying for diseases and insects, replace dead or dying materials, pruning as directed, maintaining proper grades of plants, and providing any other reasonable operations of maintenance and protection required for successful completion of the project.

D. Any date when the Contractor fails to adequately water, replace unsuitable planted areas and other work determined to be necessary by the Owner, will **NOT** be credited as part of the establishment/maintenance period.

E. The establishment of turfgrass seed/stolons is herein defined as being all work necessary to germinate the planted turfgrass and grow a full, healthy, uniform stand of smooth and even texture and grade with clean straight edges without weeds or bare spots, and has been mowed at least twice per Subsection 3.17. The establishment of turfgrass sod is herein defined as being all work necessary to develop sod without weeds or distressed areas with a minimum rooting depth of 2 inches into site soil.

F. No additional payment will be made for additional time necessary for turfgrass establishment. The maintenance period shall not start until all contract work has been completed and all close-out documents and materials have been submitted. Turfgrass will be considered weed-free if there is a maximum of one percent undesirable turfgrass species, and nine weeds or less per 50 square yards (one per 50 square feet).

G. During the progress of the maintenance period, the Contractor and the Owner's Representative shall conduct reviews at no less than 21 day intervals to determine that ongoing maintenance activities have been conducted by the Contractor. If in the opinion of the Owner, ongoing maintenance has not been conducted by the Contractor in a satisfactory manner the maintenance period shall be suspended. The Contractor shall provide remedial work as directed by the Owner's Representative to correct the found deficiencies and schedule another review. If after the subsequent review the work is deemed acceptable, the maintenance period shall resume.

3.16 MAINTENANCE – MOWING AND DRESSING

A. For new sod, mow when 1.4 inch tall and cut down to 1.0 inch.

B. Turfgrass areas shall be mowed during the growing season a minimum of twice a week for warm-season varieties and a minimum of once a week for cool-season varieties, or at any time the grass reaches 1.4 times its mowing height. Turfgrass shall be edged weekly. The Contractor shall coordinate his watering and weed control schedules to accommodate his mowing schedule. If the Contractor is unable to mow the turf areas on the required day, he has until 5:00 pm of the next day to do the work. After that time, the Owner reserves the right to secure the services of an alternate mowing entity to perform the work. The cost for the alternate mowing will be deducted from monies owed to the Contractor. The Contractor will remain responsible to perform all scheduled mowings and maintenance of the site. The turfgrass shall be mowed and edged, and all trash and debris removed prior to Final Acceptance.

3.17 MAINTENANCE - FERTILIZATION

A. The Contractor shall fertilize the warm-season turfgrass (Bermudagrass) at the start of the maintenance period and every twenty-eight (28) days with the turfgrass maintenance fertilizer at a rate of 0.75 lb. of actual N /1,000 s.f. and as modified by the soil fertility recommendations and as directed by the Landscape Architect. The Contractor shall continue the fertilizer applications until the established turf is accepted.

B. The Contractor shall fertilize the non-turf planted areas during the last week of the maintenance period with the mixed pre-planting fertilizer (14-6-11.6) at a rate of six (6.0) lbs./1,000 s.f. and as modified by the soil fertility recommendations and approved by the Landscape Architect.

3.18 MAINTENANCE – REPAIR AND WEEDING

A. Between the twenty-first (21) day and the twenty-eigth (28) day after turfgrass planting, the Contractor shall perform the following: replant all spots or areas where normal germination or growth is not evident; remove all rocks or other debris that would constitute a hindrance to mowing or cultivating; repair all damage done by his operations. Where poorly compacted trench backfill shows settlement, remove turfgrass or plants, fill all depressions and eroded channels with sufficient

conditioned topsoil to raise to proper grade, compact lightly and replant the filled areas. Roll all planted or replanted turfgrass areas with a lightly weighted turf roller in order to provide a smooth and even mowing surface.

B. Visible weeds shall be removed at least weekly during the maintenance period. At the end of the maintenance period, all planting areas shall be without weeds. If weeds are present, the Contractor shall manually remove the weeds and shall then apply a granular, selective pre-emergent herbicide at manufacturer's approved rates. Coordinate application with the Owner's Representative and provide certificates of application to Owner's Representative. The turfgrass will be considered weed-free if there are 9 weeds or less per 50 square yards (one per 50 square feet).

3.19 FINAL REVIEW

A. A Final Review will be made before the end of the Maintenance Period or upon the pending Final Acceptance of the work, whichever is earlier, provided all deficiencies revealed during the maintenance period have been corrected. If these deficiencies have not been corrected by the end of the stated maintenance period, the Contractor shall continue to fully maintain the project at his own expense. After all deficiencies have been corrected, a Final Review will be held with the Landscape Architect, Owner's Representative, and Contractor.

B. If after the Final Review, the Landscape Architect and Owner's Representative are of the opinion that the work is acceptable and complete, the Contractor's maintenance responsibility shall terminate on an agreed upon date.

3.20 WARRANTY AND REPLACEMENT

A. All trees and plants provided under this Contract shall be guaranteed to be in good, healthy, disease/pest free and in a flourishing condition one growing year from the date of Final Acceptance of the work, provided the Owner maintains the plants properly and in accordance with accepted horticultural practices. Species and size of any tree and/or plant replacements, either prior to or after Final Acceptance, shall be equal to that of the same adjacent trees and/or plants at the time of replacement as determined by the Landscape Architect.

B. The Contractor shall be responsible to replace all lost plants due to theft, vandalism or any other preventable causes till Final Acceptance of the work by the Owner. Replacement trees and plants shall be planted as originally specified and detailed. Replacement trees and plants shall be guaranteed as specified above from the date of replacement. The maintenance period may be extended for a duration of not more than the original maintenance period duration for the establishment of replacement plants.

C. The Contractor shall be held responsible for repair and/or replacement of damages to new or existing improvements resulting from the defects or actions of trees, plants, materials, equipment or workmanship one year from the date of Final Acceptance or the Notice of Completion, whichever is later.

END OF SECTION

SECTION 33 12 00
WATER UTILITIES

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Pipe and fittings for on-site domestic piping.

B. Valves and valve boxes.

C. Accessories.

1.2 RELATED SECTIONS

A. Contract General Conditions and Division 01 Specifications.
B. Section 31 11 00 - Site Clearing.
C. Section 31 22 22 - Soil Materials.
D. Section 31 23 33 - Trench Excavation and Backfill.
E. Section 32 13 13 - Site Concrete Improvements.

1.3 REFERENCES

A. ASTM Test Method D1557.

B. ANSI/ASTM D2466 - Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40.

C. ANSI/AWWA C110 - Ductile Iron and Grey-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids.

D. ANSI/AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

E. ANSI/AWWA C500 - Gate Valves, 3-inch through 48-inch NPS, for Water and Sewage Systems.

F. ANSI/AWWA C900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch, for Water.

G. ASTM D1785 - Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and Class 200.

H. ASTM D2855 - Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings.

I. ASTM D3139 - Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.

1.4 SUBMITTALS

A. Submit in accordance with Specification Section SUBMITTALS and the Contract General Conditions.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Contract General Conditions and Division 1 Specifications.

B. Accurately record actual locations of piping mains, valves, connections and appurtenances, referenced to permanent surface features.

C. Identify and describe discovery of uncharted utilities or utilities found at locations different than indicated on plans.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with product manufacturer's recommendations and these Contract Documents.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle all products required.

PART 2 - PRODUCTS

1.1 WATER PIPE

A. Ductile Iron Pipe (for iron pipe larger than 3 inches in diameter, above ground): ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51, thickness Class 50, with cement - mortar lining and seal coating per ANSI/AWWA C104/A21.4.

1. Fittings: ANSI/AWWA C110/A21.10, ductile iron.
2. Joints: Flanged.

B. PVC Pipe (for pipe 3 inches and smaller, underground): ASTM D1785, Schedule 40.

1. Fittings: ASTM D 2464, Schedule 80 PVC (ASTM D 2466, Schedule 40 PVC for pipes 1-1/2 inches and smaller).
2. Joints: ASTM D 2855, solvent weld.

C. PVC Pipe (for pipe 4 inches and larger, underground): ANSI/AWWA C900 Class 350.

1. Fittings: ANSI/AWWA C111, ductile iron.
2. Joints: ASTM D 3139 compression gasket ring.

D. Locator Tape: Tape shall be an inert material such as polyethylene plastic with a metallic core, and highly resistant to alkalis, acids, or other chemical components likely to be encountered in soils. The tape shall be bright colors for contrast with the soils with identifying print in black letters. The tape shall be six inches wide and be printed “CAUTION - WATER LINE BELOW”.

2.2 VALVES - UP TO 2 INCHES (50 MM)

A. Use full port ball valves for 2 inches and smaller and resilient wedge gate valves for 2-1/2 inches and larger size.

B. Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, IPS ends.

2.3 GATE VALVES - 2-1/2 INCHES (63 MM) AND OVER

A. ANSI/AWWA C509, Iron body, bronze trim, non-rising stem with square nut or control handle wheel, resilient single wedge, threaded or flanged.

2.4 VALVE BOXES

A. Precast Reinforced Concrete. Cast iron lid marked for service. Christy No. G5 or approved equal.

B. Valve boxes shall have a minimum 6 inch wide by 4 inch (6” inches in vehicular areas) thick concrete collar.

2.5 ACCESSORIES

A. Concrete for Thrust Blocks and Valve Box Surface Collars: Concrete type specified in Specification Section SITE CONCRETE IMPROVEMENTS.

B. Valve Boxes and Covers: Christy No. G5 traffic box, or approved equal. Cover marking shall read "Water". A one-piece PVC riser extension shall be provided as necessary to allow unobstructed access to valve operating nut.

C. Solvent Cement and Primer for PVC Pipe and Fittings: Per ASTM F656 and ASTM D2564.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions. All plot dimensions are approximate. Before proceeding with any work, carefully check and verify all dimensions and report any variations to the Engineer.

B. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, etc., which may be required. Carefully investigate the structural and finished conditions affecting all work, and plan work accordingly, furnishing such fittings, etc., as may be required to meet such conditions. Unless dimensions are shown, drawings are generally diagrammatic and indicative of the work to be installed in the most direct and workmanlike manner, so that conflicts between water systems, planting, and architectural features will be minimized.

C. Do not install the facilities as indicated on the drawings when it is obvious in the field that unknown obstructions might not have been considered in the engineering. Such obstructions or differences should be brought to the attention of the Engineer before proceeding.

3.2 PREPARATION

A. Prepare for pipe installation by assembling all needed materials.

B. Cover all PVC pipe during storage.

3.3 BEDDING

A. Excavate trench, pit or hole in accordance with Specification Section TRENCH EXCAVATION AND BACKFILL.

B. Where trench or pit has been overexcavated, place bedding material at bottom of excavations, level soil materials in continuous layers not exceeding 8-inches loose uncompacted depth.

C. Backfill around sides and to a level 6-inches above the top of pipe with bedding sand, tamped in place.

D. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE AND FITTINGS

A. Install pipe at locations and depths indicated on plans.

B. Install pipe, fittings, and associated materials in accordance with manufacturer’s recommendations.

C. Route pipe in straight line, whenever possible. All changes in direction of pipes shall be made with fittings, not by bending.

D. Install pipe to allow for expansion and contraction without stressing pipe or joints.

E. Form and place concrete for thrust blocks at each elbow, tee, angle or other significant change of direction in loose-joint pipe, per detail on plans.

F. Establish elevations of buried piping to ensure not less than 30-inches of cover, except at connections to existing lines, which may be shallower or deeper, or where shown otherwise on plans.

G. When two water pipes are to be installed in same trench, maintain a minimum 4-inch horizontal clearance between pipes.

H. Backfill trench or other excavation in accordance with Specification Section TRENCH EXCAVATION AND BACKFILL.

3.5 INSTALLATION - VALVES

A. Set valves on solid bearing.

B. Where valves are installed below finish surface grade, center and plumb valve box and any necessary extensions over valve. Set box cover flush with finished grade.

C. Pour concrete collar around top of valve box per detail on plans.

D. Furnish and install valves and valve boxes in addition to those shown on plans as required for isolation of lines for construction and disinfection, while minimizing disruption of service to buildings, at no additional cost to the Owner.

3.6 INSTALLATION - THREADED CONNECTIONS

A. Assemble all plastic and galvanized steel threaded pipe and fittings using an approved Teflon tape applied to the male threads only. A minimum of two (2) wraps and a maximum of three (3) wraps of an approved Teflon tape will be required.

B. At all plastic (PVC) pipe connections, work the ductile iron connections first. Connections shall always be plastic into steel, never steel into plastic.

C. A non-hardening sealant and lubricant similar to Permatex #51 or LASCO blue pipe sealant may be used in lieu of Teflon tape. Apply sealant to clean male threads brushing into grooves and to the first three threads of the female threads.

3.7 PRESSURE TESTING OF SITE WATER PIPING SYSTEM

A. General: Unless otherwise directed, tests shall be witnessed by Inspector. Work to be concealed shall not be covered until prescribed tests are made. Should any work be covered before such tests, the Contractor shall, at his expense, uncover, test and repair his work and that of other contractors to original conditions. Leaks and defects shown by tests shall be repaired and entire work re-tested. Tests may be made in sections, however, all connections between sections previously tested and new section must be included in the test.

B. Water Piping: Pressure test all onsite water piping systems in accordance with AWWA Standard C605, “Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings”. The pressure testing process shall be performed in cooperation with the authority having jurisdiction and witnessed by the Owner’s Inspector. The constructor shall supply an affidavit of compliance to the Owner as required by AWWA Standard 605. Maintain 150 PSIG water pressure for a duration of four (4) hours. There shall be no drop in pressure during test except that due to ambient temperature changes. Flush all lines prior to pressure test.

C. Backflow Preventer: All backflow preventers shall be tested according to manufacturer’s recommendations and the USC Cross Connection Control and Hydraulic Research Manual latest edition and per local AHJ requirements. Testing shall be performed by an AWWA Certified Backflow Prevention Assembly Tester. Contractor shall provide written certification to the Architect sowing the date in which the backflow preventers were tested and confirmation that unit passed all test requirements.

3.8 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect all domestic water piping systems in accordance with AWWA Standard C651, "Disinfecting Water Mains", and in accordance with administrative authority. Disinfection process shall be performed in cooperation with health department having jurisdiction and witnessed by the Owner’s Inspector. During procedure, signs shall be posted at each water outlet stating, "Chlorination - Do Not Drink". After disinfection, water samples shall be collected for bacteriological analysis. Certificate of Bacteriological Purity shall be obtained and delivered to the Owner by the Owner’s Inspector.

3.9 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of the Contract General Conditions and Division 01 Specifications.

B. Compaction testing of bedding and backfill will be performed in accordance with ANSI/ASTM D1557.

C. If tests indicate work does not meet specified requirements, recompact, or remove and replace, and retest. Any retests required due to failure of initial tests shall be paid for by the Contractor.

END OF SECTION

SECTION 33 30 00
SITE SEWER SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Sanitary Sewer Pipelines and Fittings

B. Site Accessories

1.2 RELATED SECTIONS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications sections, apply to the work of this section.
B. Section 31 11 00 - Site Clearing
C. Section 31 20 00 - Earthwork: Excavation, Filling, and Grading
D. Section 31 22 22 - Soil Materials
E. Section 31 23 33 - Trench Excavation and Backfill
F. Section 32 13 13 - Site Concrete Improvements

1.3 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies

1. Safety Regulations: Work shall comply with all Federal, State and Municipal regulations regarding safety, including the requirements of the following:

a. William-Steiger Occupational Safety & Health Act of 1970.
b. State of California, California Administrative Code, Title 8 Industrial Relations, Chapter 4, Subchapter 4, "Construction of Safety Orders" and other State and local agencies having jurisdiction.
c. All trenching work shall conform to Trench Construction Safety Orders of California State Industrial Accident Commission.

1.4 REFERENCES

A. American Water Works Association (AWWA).

B. American Society for Testing and Materials (ASTM):

1. Designation D3034 - Polyvinyl Chloride (PVC) pipe.

C. California Plumbing Code, Latest Edition (CPC).

D. Local County Health Department Standards.

1.5 SUBMITTALS

A. Submit under provisions of Specification Section - SUBMITTAL PROCEDURES. Certificates of compliance for material

B. Product Data: Provide data indicating pipe, accessories, and associated equipment to be furnished.

C. Submit manufacturer's data and/or fabrication drawings for Sanitary Sewer Pipelines, Sanitary Sewer Manholes and Sanitary Sewer Fittings, installed under this Section. No items shall be incorporated into the work until submittals are approved by the Engineer.

1.6 COORDINATION

A. Verify location of existing utilities have been indicated at by local utility authorities.

1.7 EXISTING UTILITIES

A. The Engineer has made a diligent attempt to indicate on the plans the location of all main and trunkline utility facilities which may affect the Work. In most cases, however, the only available information relative to the existing location of said facilities was small scale undimensioned plats. The location of said facilities, therefore, shall be considered approximate only, until exposed by the Contractor.

B. Service laterals and appurtenances have also been shown where information was available as to their location. In most cases, however, the only available information relative to the existing location of said facilities was small scale undimensioned plats. The location of said facilities, therefore, shall be considered approximate only, until exposed by the Contractor.

C. At new work location, expose by hand methods all existing utilities along the route of the new work prior to using any mechanical equipment. If mechanical equipment is allowed at a particular location, it may only be used after the completion by the Contractor of a successful exhaustive search by hand methods to locate all existing facilities as indicated on the plans, and as indicated at the work site by local utility authorities.

D. Maintain all existing utility mains and service lines in constant service during construction of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Sanitary sewer pipelines for pipes 4 inches and larger shall be polyvinyl chloride (PVC) pipe conforming to ASTM Designation 3034, SDR-35, with elastomeric gasket joints per ASTM D 3212 and F477.

B. Sanitary sewer pipelines for pipe less than 4 inches shall be Schedule 40 PVC pipe, ASTM D1785.

C. All sanitary sewer fittings shall be watertight connections using PVC sewer fittings as approved by the California Plumbing Code, or approved equal to be determined by the Civil Engineer.

D. Surface cleanouts to be furnished and installed per plans and Plumbing Codes.

E. Locator Tape: Tape shall be an inert material such as polyethylene plastic with a metallic core, and highly resistant to alkalis, acids, or other chemical components likely to be encountered in soils. The tape shall be bright colors for contrast with the soils with identifying print in black letters. The tape shall be six inches wide and be printed “CAUTION - SEWER LINE BELOW”.

PART 3 - EXECUTION

3.1 CLEARING OF WORK SITE FOR SITE IMPROVEMENTS

A. Clear site for improvements per construction drawing demolition plan and in accordance with Specification Section SITE CLEARING.

3.2 TRENCH EXCAVATION

A. Trench excavation and backfilling shall be in accordance with Specification Section TRENCH EXCAVATION AND BACKFILL and construction drawing detail.

3.3 BEDDING

A. Excavate trench, pit or hole in accordance with Specification Section TRENCH EXCAVATION AND BACKFILL.

B. Where trench or pit has been overexcavated, place bedding material at bottom of excavations, level soil materials in continuous layers not exceeding 8-inches loose uncompacted depth.

C. Backfill around sides and to a level 6-inches above the top of pipe with bedding sand, tamped in place.

D. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 PIPE INSTALLATION

A. Pipe Laying: Alignment and elevation stakes shall be set at intervals with offsets and cut to the invert of the pipe.

1. Proper facilities shall be provided for stringing and lowering sections of pipe into the trench. The pipe shall be laid carefully to lines and grades given.
2. The grade line shown on the plans indicates the flow line or invert of the pipe and all cuts, unless otherwise indicated, refer to this line.
3. After the trench for pipe has been brought to the proper line and grade, the pipe shall be laid in the following manner.

a. Pipe laying shall proceed upgrade with the bell ends of bell and spigot pipe placed upstream. Each section of pipe shall be laid to line and grade as herein specified and in such a manner as to form a watertight, concentric joint with the adjoining pipe. The interior of the pipe shall be cleared of all dirt and debris and excess joint sealing material as the work progresses. Pipe shall not be laid when the condition of the trench or weather is unsuitable. All open ends of pipe and fittings shall be adequately and securely closed whenever the work is discontinued for more than one-half hour. If pipe with elliptical or quadrant reinforcement is used, care shall be taken to properly orient the axis.

4. All joint surfaces shall be cleaned before joints are made.
5. The Contractor shall furnish and use, for grade and alignment control, a laser beam system which complies with OSHA requirements. The laser system shall have good visibility when used with suitable target material. The laser system must be of the self-leveling type so that the laser beam is automatically compensated for minute grade disturbances.
6. The laser system must also have an early warning system that instantly warns the pipe layer when the laser is off grade. The laser system is to be provided by the Contractor and shall have a minimum accuracy of ±0.01 foot per one hundred feet (100') on line; and a minimum visible range of one thousand feet (1000'). When conditions are such that this method is impractical, such as on short pipe runs, the Contractor shall have an Engineer on the ground to set grade of each joint of pipe by means of an Engineer's level.

B. Sewer Systems Plugs: Temporary plugs of brick or mortar shall be installed on all sewer projects at points of connection to existing facilities. These plugs shall remain in place until completion of the balling and flushing operation. The plugs, intended to prevent water from the balling and flushing operation, drainage, or any other condition from entering the existing system, shall be installed or removed in the presence of and under the direct supervision of the Engineer. Until the system has been pumped clear of accumulated water, the plugs shall not be removed. This water must not be allowed to enter adjacent sewer or drainage systems.

C. Internal Inspection: Upon completion of construction and prior to final inspection, the Contractor shall clean the entire new pipeline of all dirt and debris. Any dirt or debris in previously existing pipes or ditches in the area, which in the opinion of the Engineer resulted from the new installation, shall also be removed by the Contractor. Sewer pipes shall be cleaned by the controlled balling method. Temporary plugs shall be installed and maintained during cleaning operations at points of connection to existing facilities to prevent water, dirt, and debris from entering the existing facility. Temporary plugs for sewer systems shall also conform to Subsection B, above. Water from the drainage system operations shall be routed through a suitable trap to collect any dirt and debris prior to discharging into any downstream facility. The Contractor shall notify the Architect immediately after completion of the pipe cleaning operations. Cleaning of drainage pipes by the controlled balling method will not be required.

D. As soon as possible after the completion of the pipe cleaning, and prior to final acceptance, the Architect or Engineer may make a visual internal inspection of the new pipeline either manually or with television equipment.

3.5 COORDINATION

A. Coordinate with the campus for the shutdown of the existing sewer system to make new sewer connection. Install sewer pipelines before making tie-in to the existing sewer pipeline. Tie-in work may proceed during the campus non-use of the existing sewer system such as on weekends.

3.6 TESTING OF SANITARY SEWERS

A. After cleaning per Section 3.4-C, each section of sewer constructed shall be tested in accordance with acceptable "Low Pressure Air Test for Sanitary Sewers" methods such as presented in the Journal of Sanitary Engineering, Division ASCE, April 1964, to test the point of effluent disposal. All lines and components shall be leak proof.

3.7 INSPECTION OF SANITARY SEWERS

A. System components shall be properly identified as to the manufacturer.

3.8 CLEAN-UP

A. Remove from the site all rubbish, debris, etc. in a lawful manner, resulting from work in this Section. The clean-up shall include the replacement and repair of any damaged or disturbed property.

END OF SECTION

SECTION 33 40 00
STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY:

A. This section includes the following:

1. Provide all materials, labor, equipment and services necessary to furnish and install Storm Drainage System, accessories and other related items necessary to complete the Project as indicated by the Contract Documents unless specifically excluded.

B. RELATED SECTIONS:

1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Divisions 00 and 01 sections, apply to this work.
2. Section 31 22 22 – Soil Materials
3. Section 31 23 33 – Trench Excavation and Backfilling.
4. Section 32 13 13 – Site Concrete Improvements.

1.3 REFERENCES

A. ANSI/ASTM C76 - Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

B. ANSI/ASTM C443 Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

C. ANSI/ASTM C478 Precast Reinforced Concrete Manhole Sections.

D. ASTM D1557

1.4 DEFINITIONS

A. Bedding: Fill placed under, around, beside and directly over pipe, prior to subsequent backfill operations.

B. Utility: Any buried or above ground pipe, conduit, cable, associate device or appurtenances, or substructure pertaining thereto.

1.5 SUBMITTALS

A. Submit under provisions of Division 01.

B. Certificates of compliance for material.

C. Product Data: Provide data indicating pipe, accessories, and associated equipment to be furnished.

D. Submit manufacturer's data and/or fabrication drawings for all pipes, and appurtenances installed under this Section. No items shall be incorporated into the work until submittals are approved by the Architect/Engineer

1.6 COORDINATION

A. Coordinate work with Owner's personnel.

B. Verify that the location of existing utilities have been indicated at work site by utility authorities and Owner's personnel.

C. Coordinate work with other project work.

1.7 EXISTING UTILITIES

A. The Engineer has made a diligent attempt to indicate on the plans the location of all main and trunkline utility facilities which may affect the Work. In most cases, however, the only available information relative to the existing location of said facilities was small scale undimensioned plats. The location of said facilities, therefore, shall be considered approximate only, until exposed by the Contractor.

B. Service laterals and appurtenances have also been shown where information was available as to their location. In most cases, however, the only available information relative to the existing location of said facilities was small scale undimensioned plats. The location of said facilities, therefore, shall be considered approximate only, until exposed by the Contractor.

C. At new work location, expose by hand methods all existing utilities along the route of the new work prior to using any mechanical equipment. If mechanical equipment is allowed at a particular location, it may only be used after the completion by the Contractor of a successful exhaustive search by hand methods to locate all existing facilities as indicated on the plans, and as indicated at the work site by Owner's personnel.

D. Maintain all existing utility mains and service lines in constant service during construction of the Work

1.8 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 01.

B. Accurately record actual locations of utilities encountered.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reinforced Concrete Pipe for pipe larger than fifteen (15) inches: ANSI/ASTM C76, Class 3, with rubber gasket joints per ANSI/ASTM C443.

B. Storm drainage sewer pipeline shall be polyvinyl chloride (PVC) pipe for storm sewer conforming to ASTM designation 3034, SDR 35, with elastomeric gasket joints per ASTM D 3212 for pipe fifteen (15) inches or less.

C. Storm drainage pipeline shall be polyvinyl chloride (PVC) pipe for storm sewer conforming to ASTM D1785, Schedule 4d0, for pipe three (3) inches or less.

D. Poured in Place Concrete: Specification Section SITE CONCRETE IMPROVEMENTS.

E. Mortar: Composed of one part, by weight, portland cement (Type II low alkali per ASTM C150), 2 parts, by weight, sand, and water.

F. Manhole Frames, Covers and Grates: Cast Iron per ASTM A48, Class 25.

G. Soil Fill for Concrete Pipe Bedding Envelope: Specification Section TRENCH EXCAVATION AND BACKFILL.

H. Catch basins and drain inlets shall be constructed as per detail drawing.

I. Concrete collar shall be constructed as per detail drawing.

J. Cleanout shall be constructed as per detail drawing.

K. All metallic pipe, fittings and appurtenances in contact with soil shall be coated or wrapped with an approved material, as required to protect it from corrosive soil.

L. Locator Tape: Tape shall be an inert material such as polyethylene plastic with a metallic core, and highly resistant to alkalis, acids, or other chemical components likely to be encountered in soils. The tape shall be bright colors for contrast with the soils with identifying print in black letters. The tape shall be six inches wide and be printed “CAUTION – STORM SEWER LINE BELOW”.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions.

3.2 PREPARATION

A. Identify location of proposed storm drainage facilities to be constructed. Expose connection points to existing system.

B. Locate, identify, and protect existing above and below grade utilities from damage.

C. Protect plant life, lawns, trees, shrubs, and other features not authorized for removal.

D. Protect existing structures and other improvements to remain from damage from excavation equipment and vehicular traffic.

E. Employ equipment and methods appropriate to the work site.

F. Protect excavated areas from drainage inflow, and provide drainage to all excavated areas. Dewater existing drainage basins and existing drainage pipeline systems as necessary to accomplish the work.

G. Comply with safety requirements as they pertain to excavations, per Specification Section EARTHWORK.

H. Remove all interfering surface and subsurface improvements authorized for removal.

3.3 EXCAVATION

A. Excavate soil required to locate existing utilities and install the work.

B. Excavate trenches and pits per Specification Section EARTHWORK.

C. Excavate trenches and pits to allow installation and construction of the storm drainage facilities to the alignment, grades, depths and cross-sections as indicated on the construction plans.

D. Excavate trench to depth which is 6 inches below the outside bottom of the pipe barrel to be placed therein.

E. Cut trenches just wide enough to allow the installation of the pipe and pipe bedding as indicated on the plans. Minimize trench width above the pipe.

F. Provide protection to public per Division 01.

3.4 INSTALLATION AND BEDDING OF STORM DRAIN PIPE

A. Install the pipe and fittings to the lines and grades shown on the construction plans.

B. Install pipe and fittings in accordance with the manufacturer's recommendations, and these specifications.

C. Unless otherwise approved by the Engineer, lay all pipe upgrade from structure to structure, with bell or socket ends of pipe upgrade.

D. Excavate suitable bell (or socket) holes in the bedding material, so that the bells do not bear on the subgrade or bedding. Provide uniform bearing of pipe barrel on bedding material.

E. Ensure that all joints are properly "homed" and are watertight.

F. Excavate trench, pit or hole in accordance with Specification Section TRENCH EXCAVATION AND BACKFILL.

G. Where trench or pit has been overexcavated, place bedding material at bottom of excavations, level soil materials in continuous layers not exceeding 8-inches loose uncompacted depth.

H. Backfill around sides and to a level 6-inches above the top of pipe with bedding sand, tamped in place.

I. Maintain optimum moisture content of bedding material to attain required compaction density.

3.5 INSTALLATION OF STORM DRAINAGE STRUCTURES AND APPURTANCANCES

A. Install storm drainage structures as indicated on the construction plans, in accordance with the manufacturer's recommendations, and as specified herein.

B. Construct poured-in-place concrete per Specification Section SITE CONCRETE IMPROVEMENTS.

C. Key top of poured-in-place concrete bases for structures to receive the tongue of precast riser sections.

D. Construct cleanout, outfall structure per detail drawing.

3.6 BACKFILLING TO FINISHED GRADE AND FINISHED GRADING

A. Place and compact backfill per Specification Section TRENCH EXCAVATION AND BACKFILL.

B. Conform finished surface to the lines, grades and cross-sections shown on the plans, or as otherwise directed by the Inspector.

C. In areas to receive paving or a significant thickness of sealing material, temporarily set manhole frame and cover below finish grade, then return after final surfacing and/or pavement sealing and bring manhole frame and cover to final grade, as shown on the plans.

D. Fine grade all finished soil surfaces disturbed to the lines, grades and cross-sections shown on the plans.

E. Rake and smooth all finished dirt surfaces.

3.7 TOLERANCES

A. Pipe laying tolerances:
   1. Above grade: Not to exceed 1/4-inch above planned grade.
   2. Below grade: Not to exceed 1/2-inch below planned grade.
   3. Alignment: Not to exceed 2 inches from planned alignment, if gradual and regular over a distance of 20 feet.

B. Structure finish grade tolerance: Within 1/4 inch of planned grade, but must match adjacent improvements.

3.8 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 01.

B. Compaction testing of bedding and backfill will be performed in accordance with ASTM D 1557.

C. If tests indicate work does not meet specified requirements, recompact, or remove and replace, and retest at no additional cost to Owner.

END OF SECTION

REQUIREMENTS CHECKLIST

CALIFORNIA GREEN BUILDING STANDARD 2022
NON-RESIDENTIAL MANDATORY MEASURES

Project Name: New Modular Buildings at Franklin Elementary School
Project Number: 23-12259
Date: 10/09/24

DIVISION 5 MANDATORY STANDARDS FOR NONRESIDENTIAL BUILDINGS

SECTION 5.1- PLANNING AND DESIGN

Code Section	Requirement	Included in Scope	Discipline	Reference	Comments
5.106.4.2.1	Bicycle parking: Student bicycle parking.	-	-	N/A	No new parking added.
5.106.4.2.2	Bicycle parking: Staff bicycle parking.	-	-	N/A	No new parking added.
5.106.5.3	Electric vehicle (EV) charging. EVCS = 4 Future Required for 17 Parking Stalls . No EVCS/EVSE Required per 5.106.5.3.1	X	A	A100 Overall Site Plan	Limited Parking Improvements
5.106.5.3.1	Electric vehicle (EV) charging: Single charging space requirements.	-	-	N/A	Limited Parking Improvements
5.106.5.3.2	Electric vehicle (EV) charging: Multiple charging space requirements.	-	-	N/A	Limited Parking Improvements
5.106.5.3.4	Electric vehicle (EV) charging: Identification.	-	-	N/A	Limited Parking Improvements
5.106.5.3.5	Electric vehicle (EV) charging: Future charging stations.	X	E	E100 Elec Site Plan	Limited Parking Improvements
5.106.8	Light pollution reduction.	X	MB	Modular Drawings	-
5.106.10	Grading and paving.	X	C	Civil Drawings	-
5.106.12	Shade trees.	X	L	Landscape Drawings	-
5.106.12.1	Shade trees: Surface parking areas.	X	-	Landscape Drawings	-.
5.106.12.2	Shade trees: Landscape areas.	X	L	Landscape Drawings	-
5.106.12.3	Shade trees: Hardscape areas.	X	L	Landscape Drawings	-

SECTION 5.2 - ENERGY EFFICIENCY

Code Section	Requirement	Included in Scope	Discipline	Reference	Comments
5.201.1	California Energy Code.	X	MB	Modular Drawings	-

SECTION 5.3- WATER EFFICIENCY AND CONSERVATION

Code Section	Requirement	Included in Scope	Discipline	Reference	Comments
5.303.3.1	Water conserving plumbing fixtures and fittings: Water closets.	X	MB	Modular Drawings	-
5.303.3.2.1	Water conserving plumbing fixtures and fittings: Urinals – Wall mounted Urinals.	-		N/A	Not in scope.
5.303.3.2.2	Water conserving plumbing fixtures and fittings: Urinals – Floor mounted Urinals.	-		N/A	Not in scope.
5.303.3.3.1	Water conserving plumbing fixtures and fittings: Showerheads – Single showerhead.	-		N/A	Not in scope.
5.303.3.3.2	Water conserving plumbing fixtures and fittings: Showerheads – Multiple showerheads serving one shower.	-		N/A	Not in scope.
5.303.3.4.1	Water conserving plumbing fixtures and fittings: Faucets and fountains – Non-residential lavatory faucets.	X	MB	Modular Drawings	-
5.303.3.4.2	Water conserving plumbing fixtures and fittings: Faucets and fountains – Kitchen faucets.	-		N/A	Not in scope.
5.303.3.4.3	Water conserving plumbing fixtures and fittings: Faucets and fountains – Wash fountains.	-		N/A	Not in scope.
5.303.3.4.4	Water conserving plumbing fixtures and fittings: Faucets and fountains – Metering faucets.	X	MB	Modular Drawings	-
5.303.3.4.5	Water conserving plumbing fixtures and fittings: Faucets and fountains – Metering faucets for wash fountains.	-		N/A	Not in scope.
5.303.6	Standards for plumbing fixtures and fittings.	X	MB	Modular Drawings	-
5.304.6.1	Outdoor potable water use in landscape areas: Newly constructed landscapes.	-		N/A	Not in scope.
5.304.6.2	Outdoor potable water use in landscape areas: Rehabilitated landscapes.	X	L	Landscape Drawings	-

SECTION 5.4 - MATERIAL CONSERVATION AND RESOURCE EFFICIENCY

Code Section	Requirement	Included in Scope	Discipline	Reference	Comments
5.407.1	Weather protection.	X	MB	Modular Drawings	-
5.407.2.1	Moisture control: Sprinklers.	X	L	Landscape Drawings	-
5.407.2.2	Moisture control: Entries and openings.	X	MB	Modular Drawings	-
5.407.2.2.1	Moisture control: Entries and openings – Exterior door protection.	X	MB	Modular Drawings	-
5.407.2.2.2	Moisture control: Entries and openings – Flashing.	X	MB	Modular Drawings	-
5.408.1.1	Construction waste management: Construction waste management plan.	X	SC/MB	Specification Sec. 017419	Requirements defined.
5.408.1.2	Construction waste management: Construction waste management company.	X	SC/MB	Specification Sec. 017419	Requirements defined.
5.408.1.3	Construction waste management: Waste stream reduction.	X	SC/MB	Specifications Sec. 017419	Requirements defined.
5.408.1.4	Construction waste management: Documentation.	X	SC/MB	Specifications Sec. 017419	Requirements defined.
5.410.1	Recycling by occupants.	-		N/A	Existing recycling program.
5.410.1.2	Sample ordinance.	-		N/A	Existing recycling program.

SECTION 5.5- ENVIRONMENTAL QUALITY

Code Section	Requirement	Included in Scope	Discipline	Reference	Comments
5.504.3	Covering of duct openings and protection of mechanical equipment during construction.	X	MB	Modular Drawings	-
5.504.4.1	Finish material pollutant control: Adhesives, sealants, caulks.	X	MB	Specification Sec. 018113	Requirements defined.
5.504.4.3	Finish material pollutant control: Paints and coatings.	X	MB	Specification Sec. 018113	Requirements defined.
5.504.4.3.1	Finish material pollutant control: Paints and coatings – Aerosols paints and coatings.	X	MB	Specification Sec. 018113	Requirements defined.
5.504.4.4	Finish material pollutant control: Carpet systems.	X	MB	Specification Sec. 018113	Requirements defined.
5.504.4.4.1	Finish material pollutant control: Carpet systems – Carpet cushions.	-	-	N/A	Not in scope.
5.504.4.4.2	Finish material pollutant control: Carpet systems – Carpet adhesive.	X	MB	Specification Sec. 018113	Requirements defined.
5.504.4.5	Finish material pollutant control: Composite wood products.	X	MB	Specification Sec. 018113	Requirements defined.
5.504.4.6	Finish material pollutant control: Resilient flooring systems.	-	-	N/A	Not in scope.
5.504.5.3	Filters.	X	MB	Specification Sec. 018113	Requirements defined.
5.505.1	Indoor moisture control.	X	MB	Modular Drawings	CFM indicated.
5.506.1	Outside air delivery.	X	MB	Modular Drawings	-
5.504.4	Acoustical control.	-		N/A	No qualifying sources.
5.507.4.1	Acoustical control: Exterior noise transmission, prescriptive method.	-		N/A	No qualifying sources.
5.507.4.1.1	Acoustical control: Exterior noise transmission, prescriptive method – Noise exposure where noise contours are not readily available.	-		N/A	No qualifying sources.
5.507.4.2	Acoustical control: Performance method.	-		N/A	No qualifying sources.
5.507.4.2.1	Acoustical control: Performance method – Site features.	-		N/A	No qualifying sources.
5.507.4.2.2	Acoustical control: Documentation of compliance.	-		N/A	No qualifying sources.
5.507.4.3	Acoustical control: Interior sound transmission.	-		N/A	No qualifying spaces.
5.508.1.1	Ozone depletion and greenhouse gas reductions: Chlorofluorocarbons (CFCs).	-		N/A	No CFCs present in equipment.

Disciplines
C Civil Engineer
L Landscape Designer
MB Modular Building Manufacturer
SC Site Work Contractor

FACS
Forensic Analytical Consulting Services

June 4, 2024

Hazardous Building Materials Survey Report

Multiple Portables Survey
Franklin Elementary School
2739 Franklin Road
Merced, CA 95348

Prepared for:

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FACS Project #PJ81808

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Appendix A: Asbestos Functional Space Notes, Sample Chain-of-Custody and Laboratory Results Report

Appendix B: Lead Paint Chip Summary, Sample Chain-of-Custody, Laboratory Results Report and CDPH 8552 Form

Appendix C: Site Photos and Sample Location Drawing

Appendix D: Certifications of Personnel and Laboratories

List of Acronyms

AAS	Atomic Absorption Spectroscopy
ACBM	Asbestos-Containing Building Material
ACCM	Asbestos-Containing Construction Material
ACM	Asbestos-Containing Material
AHERA	Asbestos Hazard Emergency Response Act
AIHA	American Industrial Hygiene Association
CAC	California - Certified Asbestos Consultant
Cal/OSHA	California Occupational Safety and Health Association
CCR	Code of California Regulations
CFR	Code of Federal Regulation
CSST	California – Certified Site Surveillance Technician
DOSH	Department of Occupational Safety and Health
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency (EPA)
FACS	Forensic Analytical Consulting Services, Inc.
ICP	Inductively Coupled Plasma
LCP	Lead-Containing Paint
LBP	Lead-Based Paint
ND	None Detected
NESHAP	National Emissions Standard Hazardous Air Pollutants
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Science and Technology
NVLAP	National Voluntary Laboratory Accreditation Program
PCM	Phase Contrast Microscopy
PLM	Polarized Light Microscopy
SGS	SGS - Forensic Laboratories
TEM	Transmission Electron Microscopy
TTLC	Total Threshold Limit Concentration
XRF	X-Ray Fluorescence Spectrum Analyzer
<	Less Than Reporting Limit

Executive Summary

Forensic Analytical Consulting Services, Inc. (FACS) was retained by Merced City School District to perform an asbestos and lead paint survey of multiple portables of Franklin Elementary School, located at 2739 Franklin Road in Merced, California. The survey included any suspect asbestos-containing materials (ACM) and suspect paints and coatings which may be disturbed during the planned relocation/demolition project. A summary list of suspect asbestos-containing materials which were identified and sampled is included in Appendix A of this report. A table reporting suspect lead-containing paints or coatings which were identified and sampled is included in Appendix B of this report. The survey was performed on May 16, 2024.

Asbestos

The following suspect materials were sampled during this survey and identified to **contain** asbestos by laboratory analysis:

- **Sink Coating – 7% Chrysotile**
- **Siding Sealant – 2% Chrysotile**

The following suspect materials were sampled during this survey and identified to **not contain** asbestos by laboratory analysis:

- **Carpet & Mastic – Purple/Green Multi**
- **4" Baseboard & Mastic – Grey**
- **Tackboard**
- **2x4 FCP – Pinhole Fissure**
- **Carpet & Mastic – Black Walk-Off**
- **Wood & Mastic**
- **Linoleum & Mastic – Blue w/ Specks**
- **6" Baseboard & Mastic – Grey**
- **FRP – Rough**
- **Linoleum & Mastic – Grey Pebble**
- **Bolt Mastic**

Please see Appendix A for a complete listing of materials sampled at the work areas and results from this survey. Any suspect materials not included must be assumed to be asbestos-containing materials until tested and proven not to contain asbestos.

Lead

The following paints were found to be **lead-containing** by laboratory analysis:

- **Red Paint on Metal Door – Portables**
- **Blue Paint on Metal Door – Portables**

The following paints did not contain detectable concentrations of lead above the laboratory's reporting limit:

- **Tan Paint on Metal Siding**
- **Tan Paint on Wood Siding**
- **Brown Paint on Metal Door**
- **Blue Paint on Wood Window Frame**

Please see Appendix B for a complete listing of paints sampled at the work areas and results from this survey. Any suspect paints or coatings not included must be assumed to be lead-containing until tested and proven not to contain lead above detectable levels.

FACS recommends that the results of this report be incorporated into any relocation/demolition plans provided for this project for informational purposes.

Introduction

Forensic Analytical Consulting Services, Inc. (FACS) was retained by Merced City School District to perform an asbestos and lead paint survey of multiple portables of Franklin Elementary School, located at 2739 Franklin Road in Merced, California. The survey included any suspect asbestos-containing materials (ACM) and suspect paints and coatings which may be disturbed during the planned relocation/demolition project. The survey was performed on May 16, 2024.

Scope of Work

The purpose of this survey was to identify asbestos-containing materials (ACMs) and lead-containing paints and coatings which may be disturbed during the upcoming relocation/demolition project. The visual inspection, bulk sampling, and survey documentation were performed by Trevor Leitz and Fernando Quintero. Mr. Leitz and Mr. Quintero are Division of Occupational Safety and Health (DOSH) Certified Site Surveillance Technicians (CSST #19-6682, #24-7532). Mr. Leitz and Mr. Quintero are California Department of Public Health (CDPH) Certified Lead Sampling Technicians (LRC-00003432, LRC-00011951). All work was completed under the supervision and direction of Chris Chipponeri, who is a DOSH Certified Asbestos Consultant (CAC #10-4633) and CDPH Certified Lead Inspector/Assessor (LRC-00000782), as required under California regulations. The scope of the survey and the services provided by FACS included:

- Performing a visual inspection of the project area to identify accessible suspect asbestos-containing materials (ACMs) and lead-containing paints and coatings that will be disturbed during the planned project;
- Collection of bulk material samples for asbestos laboratory analysis by polarized light microscopy (PLM);
- Collection of bulk paint chip samples for lead laboratory analysis using atomic absorption spectrometry (AAS);
- Ensuring the technical quality of all work by using Asbestos Hazard Emergency Response Act (AHERA) accredited Building Inspectors;
- Ensuring the technical quality of all work by using California Department of Public Health (CDPH) Certified Lead Sampling Technicians and Inspector/Assessors; and
- Consolidating data and findings into a report format.

Site Characterization

The Franklin Elementary School portables are comprised of common construction materials such as carpet, vinyl baseboard, tackboard, false ceiling panels, linoleum, and fiber reinforced plastic. The paints associated with the portables are tan, blue, red and brown.

Survey Methods

Document Review

No previous documentation was reviewed prior to the inspection. The extent of the planned relocation/demolition project was provided by Bryan Behn.

Visual Inspection

Accessible building materials were visually inspected using the methods presented in the Federal AHERA regulations (40 CFR, Part 763). AHERA inspection methodology is required to be used for inspections of K-12 schools and is generally accepted as the industry standard for all ACM inspections regardless of structure or facility type. Suspect ACMs were also physically assessed for friability, condition and possible disturbance factors.

All areas were accessible during this inspection.

Asbestos Inspection

Bulk Sample Collection

Bulk samples of identified homogeneous materials were collected in building areas that may be impacted by the planned renovation/demolition activities. Samples were collected of each separate homogeneous area. A homogeneous area is defined as a surfacing material, thermal system insulation, or miscellaneous material that is uniform in use, color and texture. Examples of homogeneous areas could include:

Linoleum
False ceiling panels
Tackboard
Carpet

The specific number of samples collected was determined by using the methods required by the Federal AHERA regulations (40 CFR, Part 763.86) as noted below:

1) For Surfacing Material:
   1,000 ft^2 or less - collect 3 samples
   1,001 to 5,000 ft^2 - collect 5 samples
   5,001 ft^2 or greater - collect 7 samples

2) For Thermal System Insulation:
   “In a randomly distributed manner” - collect 3 samples
   6 linear feet of patching or less - collect 1 sample
   cementitious pipe fittings - “In a manner sufficient to determine”

3) For all Miscellaneous Material:
   Collect samples "In a manner sufficient to determine whether material is ACM (asbestos-containing material) or not ACM..."

The suspect ACMs were sampled using a knife, chisel, scraper, drill or other similar coring device suitable to the type of material sampled to cut through its entire thickness and to ensure that a cross-section of the material was obtained. The material was then placed in an appropriately labeled container that was sealed and submitted to SGS-Forensic Laboratories for analysis. A unique sample number (e.g. PJ81808-01A) was assigned to each sample.

Bulk samples will be retained by the laboratory for one month unless otherwise instructed. After this period, the samples will be disposed of appropriately.

Bulk Sample Analysis

A total of thirty-three (33) bulk samples were collected from a total of thirteen (13) suspect materials. Bulk samples were analyzed by SGS-Forensic Laboratories (SGS) in Hayward, California. SGS is accredited by the California Department of Public Health (CDPH) Environmental Laboratory Accreditation Program (ELAP) and the National Institute of Science and Technology's (NIST) National Voluntary Laboratory Accreditation Program (NVLAP). SGS participates in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing Program and has substantial experience in the analysis of asbestos.

All samples were analyzed using Polarized Light Microscopy with Dispersion Staining (PLM/DS) techniques in accordance with the methodology approved by the U.S. Environmental Protection Agency (EPA). The percentage of asbestos present in the samples was determined on the basis of a visual area estimation. The EPA defines asbestos-containing materials (ACM) as any material containing more than one percent (1%) asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy (PLM). 40 CFR Part 763 identifies the lower limit of reliable quantification for asbestos using the PLM method as approximately one percent (1%) by volume. Regulations in California (CAL/OSHA Title 8 CCR 1529) define asbestos-containing construction materials (ACCM) as those materials having asbestos content of greater than one tenth of one percent (> 0.1%); therefore, for the purpose of this survey, any amount of asbestos detected will be considered positive. In addition to the percentages, the types of asbestos minerals are also reported. The PLM method is the standard method used to analyze asbestos bulk samples.

When "None Detected" (ND) appears in the laboratory results, it should be interpreted as meaning asbestos was not observed in the sample material.

Lead Inspection

The client-defined lead inspection was conducted in accordance with the CDPH Lead-Related Construction Program and modeled upon the sampling protocol described in “Chapter 7: Lead Based Paint Inspection” of the HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing (1997 Revision).

Cal/OSHA, in Title 8 California Code of Regulations (CCR) Section 1532.1, Lead in Construction Standard which implements California Labor Code 8716-6717, regulates all construction work where an employee may be occupationally exposed to lead. Paint or materials with any detectable level of lead is considered lead-containing by Cal/OSHA.

Bulk Sampling Methodology

During this inspection, FACS personnel collected six (6) bulk paint chip samples for laboratory confirmation of lead-content. Each sample was scraped from the substrate it had been applied to using a knife or chisel to obtain sufficient material for analysis. Each sample was given a unique marker number, identified on a chain-of-custody, packaged, and sent via FedEx to SGS in Hayward, California for analysis. SGS is accredited by the American Industrial Hygiene Association’s Environmental Lead Laboratory Accreditation Program for the analysis of lead in bulk paint chips by flame atomic absorption.

Regulations

Background

Asbestos is the name of a class of magnesium-silicate minerals that occur in fibrous form. Minerals that are included in this group are chrysotile, crocidolite, amosite, anthophyllite asbestos, tremolite asbestos,

and actinolite asbestos. Although the chrysotile minerals are the most common type of asbestos found in the construction industry, all types of asbestos are regulated in the same manner. Asbestos has been used in more than 3,000 different building materials. Asbestos was added to building materials to: increase fire-resistance, insulate against heat, cold and sound, resist corrosion, and increase tensile strength. Common building materials that may contain asbestos include but are not limited to the following: floor tile, resilient sheet flooring, ceiling tile, mastics, roofing materials, fireproofing, acoustical treatments, wallboard, pipe and boiler insulations. Adverse health effects have been associated with the inhalation of airborne asbestos. However, asbestos fibers that are tightly bound in the building material, may not represent an exposure hazard, unless disturbed in such a way that releases airborne fibers (i.e., cutting, drilling, sanding, and other abrasive methods).

Building Surveys

The following is a summary of some current Federal and California State regulations which contain requirements related to the performance of building surveys for asbestos. These summaries are not intended to be all inclusive and do not contain every aspect of the regulations discussed.

U.S. EPA National Emission Standard for Hazardous Air Pollutants (NESHAPs), 40 CFR Part 61

Under the NESHAPs regulation, no visible emissions are allowed during building demolition or renovation activities which involve regulated asbestos-containing materials. For this reason, all buildings must be surveyed for asbestos-containing materials prior to demolition or renovation. The EPA, CARB, and/or the local Air Quality Management District which implements EPA actions, must be notified prior to any building demolition even if no asbestos-containing materials are present. Regulated asbestos-containing material (RACM) is defined as a) any friable material with an asbestos content of greater than one percent, or b) any non-friable material with asbestos content of greater than one percent that will, or could, become friable.

Asbestos Hazard Emergency Response Act (AHERA), 40 CFR Part 763, Subpart E

AHERA requires performance of asbestos surveys and the development of Asbestos Management Plans for all primary and secondary schools in the United States. Although this regulation applies to primary and secondary schools only, the procedures mandated under AHERA are considered the industry standard and are applied to all surveys performed by FACS unless otherwise specified by the building owner.

Worker Protection

California Assembly Bill AB3713, Health and Safety Code Division 20, Chapter 10.4, Section 25915-25924

The state of California has enacted legislation that requires building owners, employers, lessees, etc. to notify tenants, employees and contractors of the presence of asbestos in both friable and non-friable forms. In addition, preventive maintenance activities must be developed and communicated to these parties. Notification is required 15 days after the identification of ACM in the building, and annually thereafter.

Occupational Safety and Health Administration (OSHA) 29 CFR 1926.1101 and 8 CCR 1529

The Federal and State Occupational Safety and Health Administrations (OSHA) require employers to implement specific work practices which protect workers from airborne asbestos exposure.

Building materials which contain even low levels of asbestos (<1%) can potentially generate significant concentrations of airborne asbestos fibers when disturbed. Therefore, control measures should be instituted which adequately address worker health and safety during planned renovation or demolition activities involving these materials. Cal/OSHA defines asbestos-containing construction materials as those materials having greater than one tenth of one percent asbestos (>0.1%). As stated previously, there is currently no viable method to accurately quantify asbestos at this level.

Hazardous Waste

Building materials reported to contain less than one percent (<1%) of asbestos are not considered hazardous by the U.S. EPA, and hence, may not require removal and disposal prior to demolition or renovation. Regulations may vary, however, between regional air quality management districts and/or other state agencies responsible for implementing EPA's rules. Therefore, local agencies should be contacted for specific ACM definitions and handling requirements. Cal/OSHA may also require special packaging and labeling on containers with asbestos-containing construction materials.

Composite sampling, which may potentially reduce the total asbestos content of the material, is only permitted when sampling joint compound, tape, and gypsum wallboard according to EPA's Asbestos NESHAP Clarification Regarding Analysis of Multi-Layered Systems (40 CFR Part 61 FRL-4821-7).

Lead

Cal/OSHA Lead (8 CCR 1532.1) & CDPH (Title 17)

If paints or coatings containing any detectable concentration of lead will be impacted, a project should be considered regulated by Cal/OSHA as lead-related construction (8 CCR 1532.1).

A contractor who has employees that may be occupationally exposed to lead during a project must perform an initial determination regarding worker exposures to lead, which may be based on personal air monitoring at the start of the project, prior employee monitoring from the past 12 months under workplace conditions closely resembling the current project, or objective data demonstrating that exposures will not exceed the Cal/OSHA action level. It is the contractor's responsibility to conduct their initial determination and comply with any relevant Cal/OSHA requirements.

Workers disturbing existing paints or coatings during a project must have lead awareness or action level training depending on the initial exposure determination and lead-safe work practices must be used. Disturbance of lead-containing paints or coatings must be performed within a contained area to prevent the spread and build-up of lead dust in order to comply with CDPH requirements. HEPA vacuums, dustless tools or shrouds, and/or intact removal of components should be employed to minimize lead dust generation and properly cleanup work areas following disturbance to lead-containing materials during a project. Waste generated during disturbance to lead-containing materials must be profiled in a hazardous waste determination to ascertain proper disposal requirements.

If the initial determination or initial exposure monitoring shows that workers impacting lead can be expected to be or are shown to be exposed to lead above the Cal/OSHA permissible exposure level workers and supervisors must have the requisite training and CDPH lead worker or supervisor certification.

It should be noted that depending on the timing of the project, lead requirements may be more stringent than those identified above due to changes to the lead construction standard (8 CCR 1532.1) that will be implemented on January 1, 2025.

EPA Renovation, Repair and Painting Rule Requirements

The EPA's Renovation, Repair, and Painting (RRP) rule applies to disturbance of lead-based paints at child-occupied facilities constructed before 1978. In the context of the RRP rule, child-occupied facility is defined as being visited by the same child under the age of 6 on two or more days per week for at least 3 hours per visit with a cumulative annual total of 60 hours.

Since lead-based paint was not detected and the structures are scheduled to be demolished, the US EPA RRP rule would not apply to this project. If the project construction area expands into other areas not sampled, then applicability of this rule to the work taking place should be evaluated.

Firms paid to perform RRP-covered work must be registered with the US EPA RRP program; this requirement applies to a General Contractor, Construction Management firm, or other entity contracting for and overseeing the work, even if the actual RRP-covered work is performed by a sub-contractor or other firm. Firms may not bid on an RRP-covered project without first obtaining firm certification, and contracts for RRP-covered projects may not be awarded to firms without firm certification. Proof of RRP firm certification must be submitted to the Owner.

The RRP rule requires distribution of the EPA's *Renovate Right* lead hazard information pamphlet before the start of covered work to occupants, building owners, and parents of children in child-occupied facilities. This may be fulfilled by distributing individual copies of the pamphlet, or publicly posting the pamphlet at accessible locations at the project site. The contractor must document how they have fulfilled this requirement and must submit this proof to the Owner.

Findings and Recommendations

Forensic Analytical Consulting Services, Inc. (FACS) was retained by Merced City School District to perform an asbestos and lead paint survey of multiple portables of Franklin Elementary School, located at 2739 Franklin Road in Merced, California.

Asbestos

The following suspect materials were sampled during this survey and identified to **contain** asbestos by laboratory analysis:

- **Sink Coating – 7% Chrysotile**
- **Siding Sealant – 2% Chrysotile**

The following suspect materials were sampled during this survey and identified to **not contain** asbestos by laboratory analysis:

- **Carpet & Mastic – Purple/Green Multi**
- **4" Baseboard & Mastic – Grey**
- **Tackboard**
- **2x4 FCP – Pinhole Fissure**
- **Carpet & Mastic – Black Walk-Off**
- **Wood & Mastic**
- **Linoleum & Mastic – Blue w/ Specks**
- **6" Baseboard & Mastic – Grey**
- **FRP – Rough**
- **Linoleum & Mastic – Grey Pebble**
- **Bolt Mastic**

Please see Appendix A for a complete listing of materials sampled at the work areas and results during this survey. Any suspect materials not included must be assumed to be asbestos-containing materials until tested and proven not to contain asbestos.

Removal of more than 100 square feet of asbestos-containing materials must be completed by a contractor registered with DOSH as an asbestos abatement contractor. The contractor must also hold the C-22 asbestos abatement license from the CSLB to perform abatement of more than 100 square feet of asbestos-containing materials.

Workers abating asbestos-containing materials must have AHERA Worker training and one worker shall be trained to the AHERA Contractor-Supervisor level. Workers will need to use containment, work practices, and engineering controls as required by Cal/OSHA for the various classes of work that may be required to be performed. The contractor performing abatement must also file a "report of use" temporary worksite notification to the local Cal/OSHA office at least 24 hours prior to mobilizing to the site.

The US EPA NESHAP regulation requires the abatement of asbestos-containing materials that are friable or likely to become friable by forces impacting them as part of any renovation activities. If more than 160 square feet of RACM will be generated by the project, a 10-working day notification must be filed with the San Joaquin Valley Air Pollution Control District prior to work commencing onsite. Those materials that are friable, or non-friable materials made friable during removal, would need to be disposed of as hazardous (regulated) asbestos-containing material. Non-friable materials that are not made friable may be disposed of as non-hazardous asbestos-containing waste material at a landfill that will accept the waste.

See the Regulations section above for additional information regarding asbestos compliance.

Lead

The following paints were found to be **lead-containing** by laboratory analysis:

- **Red Paint on Metal Door – Portables**
- **Blue Paint on Metal Door – Portables**

The following paints did not contain detectable concentrations of lead above the laboratory's reporting limit:

- **Tan Paint on Metal Siding**
- **Tan Paint on Wood Siding**
- **Brown Paint on Metal Door**
- **Blue Paint on Wood Window Frame**

Please see Appendix B for a complete listing of paints sampled at the work areas and results from this survey. Any suspect paints or coatings not included must be assumed to be lead-containing until tested and proven not to contain lead above detectable levels.

Workers that impact paints containing any detectable amount of lead must use lead-safe practices and have valid training for the method of impact to comply with Cal/OSHA, 8 CCR 1532.1. To comply with CDPH requirements, any disturbance to paints or coatings that contain lead must be completed within a contained area to prevent the creation of a lead hazard. To comply with California Department of Toxic Substance Control and Title 22 requirements, any waste streams containing lead must be profiled prior to disposal.

See the Regulations section above for additional information regarding lead compliance. As noted above, additional lead paint handling requirements may be required if the work is to be performed after January 1, 2025 based on changes to Cal/OSHA's lead construction standard (8 CCR 1532.1).

FACS recommends that the results of this report be incorporated into any relocation/demolition plans provided for this project for informational purposes.

Limitations

This investigation is limited to the conditions and practices observed, and information made available to FACS. The methods, conclusions and recommendations provided are based on FACS' judgment, expertise, and the standard of practice for professional service. They are subject to the limitations and variability inherent in the methodology employed. As with all environmental investigations, this investigation is limited to the defined scope and does not purport to set forth all hazards, nor indicate that other hazards do not exist.

Please do not hesitate to contact our office at (209) 551-2000 with any questions or concerns. Thank you for the opportunity to assist Merced City School District with promoting worker safety and a healthy environment.

Respectfully,
FORENSIC ANALYTICAL



Trevor Leitz
Environmental Health Specialist, Modesto
Cal/OSHA CSST #19-6682
CDPH LRC-00003432

Reviewed by:
FORENSIC ANALYTICAL



Chris Chipponeri
Director, Central Valley Offices
Cal/OSHA CAC #10-4633
CDPH LRC-00000782

Appendix A

Asbestos Functional Space Notes, Sample Chain-of-Custody and Laboratory Results Report

Functional Space Notes

Forensic Analytical Consulting Services, Inc.

Client: Merced City School District

Site: Franklin Elemetary School

HMS Project Number: PJ81808

Date of Inspection: May 16, 2024

Materials		Material Class	Percent Asbestos	Hmgns Matrl #	Sampled Here?	Footage Sq/Ln/Jnts	Friable? Yes/No
Building: Portables		**Room:**	**01 - Room 25**				
Floor:	Carpet & Mastic - Black Walk-Off	MISC	None Detected	5	5C	46 sq	
Floor:	Carpet & Mastic - Purple/Green Multi	MISC	None Detected	1	1B	874 sq	
Baseboard:	4" Baseboard & Mastic - Grey	MISC	None Detected	2	2B	126 ln	
Walls:	Tackboard	MISC	None Detected	3	3A	1134 sq	
Ceiling:	2x4 FCP - Fiberglass Pinhole Fissure	MISC	None Detected	4	4C	920 sq	
Building: Portables		**Room:**	**02 - Room 22**				
Floor:	Carpet & Mastic - Black Walk-Off	MISC	None Detected	5	5B	46 sq	
Floor:	Carpet & Mastic - Purple/Green Multi	MISC	None Detected	1	1A	874 sq	
Baseboard:	4" Baseboard & Mastic - Grey	MISC	None Detected	2		126 ln	
Walls:	Tackboard	MISC	None Detected	3	3G	1134 sq	
Ceiling:	2x4 FCP - Fiberglass Pinhole Fissure	MISC	None Detected	4		920 sq	
Sink:	Sink Coating - White	MISC	7 %	6		4 sq	No
Building: Portables		**Room:**	**03 - Room 23**				
Floor:	Carpet & Mastic - Black Walk-Off	MISC	None Detected	5		46 sq	
Floor:	Carpet & Mastic - Purple/Green Multi	MISC	None Detected	1		874 sq	
Baseboard:	4" Baseboard & Mastic - Grey	MISC	None Detected	2		126 ln	
Walls:	Tackboard	MISC	None Detected	3	3B	1134 sq	
Ceiling:	2x4 FCP - Fiberglass Pinhole Fissure	MISC	None Detected	4		920 sq	
Sink:	Sink Coating - White	MISC	7 %	6	6A	4 sq	No
Building: Portables		**Room:**	**04 - Room 24**				
Floor:	Carpet & Mastic - Black Walk-Off	MISC	None Detected	5		46 sq	
Floor:	Carpet & Mastic - Purple/Green Multi	MISC	None Detected	1		874 sq	
Baseboard:	4" Baseboard & Mastic - Grey	MISC	None Detected	2	2A	126 ln	
Walls:	Tackboard	MISC	None Detected	3	3E	1134 sq	
Ceiling:	2x4 FCP - Fiberglass Pinhole Fissure	MISC	None Detected	4		920 sq	

Functional Space Notes

Forensic Analytical Consulting Services, Inc.

Client: Merced City School District
Site: Franklin Elemetary School
HMS Project Number: PJ81808
Date of Inspection: May 16, 2024

Materials		Material Class	Percent Asbestos	Hmgns Matrl #	Sampled Here?	Footage Sq/Ln/Jnts	Friable? Yes/No
Building: Portables		**Room:**	**05 - Room 26**				
Floor:	Carpet & Mastic - Black Walk-Off	MISC	None Detected	5	5A	46 sq	
Floor:	Carpet & Mastic - Purple/Green Multi	MISC	None Detected	1	1C	874 sq	
Baseboard:	4" Baseboard & Mastic - Grey	MISC	None Detected	2		126 ln	
Walls:	Tackboard	MISC	None Detected	3	3D	1134 sq	
Ceiling:	2x4 FCP - Fiberglass Pinhole Fissure	MISC	None Detected	4		920 sq	
Building: Portables		**Room:**	**06 - Room 27**				
Floor:	Carpet & Mastic - Black Walk-Off	MISC	None Detected	5		46 sq	
Floor:	Carpet & Mastic - Purple/Green Multi	MISC	None Detected	1		874 sq	
Baseboard:	4" Baseboard & Mastic - Grey	MISC	None Detected	2		126 ln	
Walls:	Tackboard	MISC	None Detected	3	3F	1134 sq	
Ceiling:	2x4 FCP - Fiberglass Pinhole Fissure	MISC	None Detected	4	4A	920 sq	
Building: Portables		**Room:**	**07 - Room 28**				
Floor:	Wood & Mastic	MISC	None Detected	7	7A, 7B	920 sq	
Walls:	Tackboard	MISC	None Detected	3	3C	1134 sq	
Ceiling:	2x4 FCP - Fiberglass Pinhole Fissure	MISC	None Detected	4	4B	920 sq	
Building: Portables		**Room:**	**08 - Boys Restroom**				
Floor:	Linoleum & Mastic - Blue w/ Specks	MISC	None Detected	8	8A	82 sq	
Floor:	Linoleum & Mastic - Grey Pebble	MISC	None Detected	11	11A, 11B	68 sq	
Baseboard:	6" Baseboard & Mastic - Grey	MISC	None Detected	9	9A, 9B	50 ln	
Walls:	FRP Rough - White	MISC	None Detected	10	10A, 10B	450 sq	
Ceiling:	2x4 FCP - Fiberglass Pinhole Fissure	MISC	None Detected	4		150 sq	
Building: Portables		**Room:**	**09 - Girls Restroom**				
Floor:	Linoleum & Mastic - Blue w/ Specks	MISC	None Detected	8	8B	150 sq	
Baseboard:	6" Baseboard & Mastic - Grey	MISC	None Detected	9		50 ln	
Walls:	FRP Rough - White	MISC	None Detected	10		450 sq	
Ceiling:	2x4 FCP - Fiberglass Pinhole Fissure	MISC	None Detected	4		150 sq	
Building: Portables		**Room:**	**Exterior**				
Walls:	Siding Sealant - White	MISC	2 %	12	12A, 12B	640 ln	No
Roofs:	Bolt Mastic	MISC	None Detected	13	13A, 13B	320 sq	

Bulk Material Analysis Request Form

Forensic Analytical Consulting Services, Inc.

Modesto
P.O. Box 576848
Modesto, CA 95356
(209) 551 - 2000
FAX: (209) 575 - 5657

Date Submitted: 05/17/24
Contact: Chris Chipponeri
Collected By: Trevor Leitz
Date(s) Collected: 05/17/24

Job ID: Merced City School District
Job Site: Franklin Elemetary School

Analysis Requested: PLM with Dispersion Staining
Turn Around Time: 5 DAY
Laboratory: SGS Forensic Laboratories
Special Instructions: Please email resultes to Chris.c@facs.com and trevor.l@facs.com
Project ID / Job No: PJ81808
Bill to: Forensic Analytical Consulting Services, Inc.

Sample ID	Material Description / Location
PJ81808-1A	Carpet & Mastic - Purple/Green Multi Portables, 02 - Room 22, SE Corner
PJ81808-1B	Carpet & Mastic - Purple/Green Multi Portables, 01 - Room 25, North Center
PJ81808-1C	Carpet & Mastic - Purple/Green Multi Portables, 05 - Room 26, South Center
PJ81808-2A	4" Baseboard & Mastic - Grey Portables, 04 - Room 24, SW Corner
PJ81808-2B	4" Baseboard & Mastic - Grey Portables, 01 - Room 25, South Center
PJ81808-3A	Tackboard Portables, 01 - Room 25, NE Corner
PJ81808-3B	Tackboard Portables, 03 - Room 23, West Center
PJ81808-3C	Tackboard Portables, 07 - Room 28, NE Corner
PJ81808-3D	Tackboard Portables, 05 - Room 26, SE Corner
PJ81808-3E	Tackboard Portables, 04 - Room 24, SE Corner
PJ81808-3F	Tackboard Portables, 06 - Room 27, NW Corner
PJ81808-3G	Tackboard Portables, 02 - Room 22, NE Corner
PJ81808-4A	2x4 FCP - Fiberglass Pinhole Fissure Portables, 06 - Room 27, NE Corner
PJ81808-4B	2x4 FCP - Fiberglass Pinhole Fissure Portables, 07 - Room 28, NE Side
PJ81808-4C	2x4 FCP - Fiberglass Pinhole Fissure Portables, 01 - Room 25, Center of Space
PJ81808-5A	Carpet & Mastic - Black Walk-Off Portables, 05 - Room 26, South Center
PJ81808-5B	Carpet & Mastic - Black Walk-Off Portables, 02 - Room 22, SE Side, Center
PJ81808-5C	Carpet & Mastic - Black Walk-Off Portables, 01 - Room 25, South Center

RECEIVED
MAY 20 2024
BY: MC FX1030
6329

Submitted By: [signature]
Received By: Jasmine Contreras

Date Submitted: 5/17/24
Date Received: 5/29/24 9:00 am FE

Submitted Via: FedEx
Received Via: FE

MC 5/24/24 3:00P. FX

Date Printed: 5/17/2024

Bulk Material Analysis Request Form

Forensic Analytical Consulting Services, Inc.

Modesto
P.O. Box 576848
Modesto, CA 95356
(209) 551 - 2000
FAX: (209) 575 - 5657

Date Submitted: 05/17/24
Contact: Chris Chipponeri
Collected By: Trevor Leitz
Date(s) Collected: 05/17/24

Job ID: Merced City School District
Job Site: Franklin Elemetary School

Analysis Requested: **PLM with Dispersion Staining**
Turn Around Time: **5 DAY**
Laboratory: SGS Forensic Laboratories
Special Instructions: Please email resultes to Chris.c@facs.com and trevor.l@facs.com
Project ID / Job No: PJ81808
Bill to: Forensic Analytical Consulting Services, Inc.

Sample ID	Material Description / Location
PJ81808-6A	Sink Coating - White Portables, 03 - Room 23, South Side, at Sink
PJ81808-7A	Wood & Mastic Portables, 07 - Room 28, South Center
PJ81808-7B	Wood & Mastic Portables, 07 - Room 28, North Center
PJ81808-8A	Linoleum & Mastic - Blue w/ Specks Portables, 08 - Boys Restroom, South Center
PJ81808-8B	Linoleum & Mastic - Blue w/ Specks Portables, 09 - Girls Restroom, South Center
PJ81808-9A	6" Baseboard & Mastic - Grey Portables, 08 - Boys Restroom, South Center
PJ81808-9B	6" Baseboard & Mastic - Grey Portables, 08 - Boys Restroom, East Side, Center
PJ81808-10A	FRP Rough - White Portables, 08 - Boys Restroom, South Center
PJ81808-10B	FRP Rough - White Portables, 08 - Boys Restroom, NE Side
PJ81808-11A	Linoleum & Mastic - Grey Pebble Portables, 08 - Boys Restroom, North Center
PJ81808-11B	Linoleum & Mastic - Grey Pebble Portables, 08 - Boys Restroom, South Center
PJ81808-12A	Siding Sealant - White Portables, Exterior, Boys Restroom - NE Corner
PJ81808-12B	Siding Sealant - White Portables, Exterior, Room 28 - East Side, North End
PJ81808-13A	Bolt Mastic Portables, Exterior, Boys Restroom Roof - North Side
PJ81808-13B	Bolt Mastic Portables, Exterior, Room 27 - South Side

RECEIVED
6329
MAY 20 2024
BY: MC FX 10:30

Submitted By: [signature]
Received By: Jasmine Contreras

Date Submitted: 5/17/24
Date Received: 5/20/24 9:09am

Submitted Via: FEDEX
Received Via: FEDEX

el. mc FX 5/24/24 3:00

Date Printed: 5/17/2024

Final Report

Bulk Asbestos Analysis

(EPA Method 40CFR, Part 763, Appendix E to Subpart E and EPA 600/R-93-116, Visual Area Estimation)
NVLAP Lab Code: 101459-1

FACS - Modesto
Trevor Leitz
313 Banner Court
Suite B
Modesto, CA 95356

Client ID: MOD08
Report Number: B360277
Date Received: 05/20/24
Date Analyzed: 05/28/24
Date Printed: 05/28/24
First Reported: 05/28/24

Job ID/Site: PJ81808; Merced City School District 2739 Franklin Road Merced CA 95340

SGSFL Job ID: MOD08
Total Samples Submitted: 33
Total Samples Analyzed: 33

Date(s) Collected: 05/17/2024

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
PJ81808-1A	12747320						
Layer: Multi-Color Carpet with Pad			**ND**				
Layer: Clear Mastic			**ND**				
Layer: Grey Non-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components: Cellulose (Trace) Synthetic (85 %)		**Asbestos (ND)**					
PJ81808-1B	12747321						
Layer: Multi-Color Carpet with Pad			**ND**				
Layer: Clear Mastic			**ND**				
Layer: Wood			**ND**				
Total Composite Values of Fibrous Components: Cellulose (2 %) Synthetic (85 %)		**Asbestos (ND)**					
PJ81808-1C	12747322						
Layer: Multi-Color Carpet with Pad			**ND**				
Layer: Clear Mastic			**ND**				
Total Composite Values of Fibrous Components: Cellulose (Trace) Synthetic (85 %)		**Asbestos (ND)**					
PJ81808-2A	12747323						
Layer: Grey Non-Fibrous Material			**ND**				
Layer: Yellow Mastic			**ND**				
Layer: White Wallcovering			**ND**				
Layer: Tan Fibrous Material			**ND**				
Total Composite Values of Fibrous Components: Cellulose (7 %)		**Asbestos (ND)**					
PJ81808-2B	12747324						
Layer: Grey Non-Fibrous Material			**ND**				
Layer: Yellow Mastic			**ND**				
Layer: White Wallcovering			**ND**				
Layer: Tan Fibrous Material			**ND**				
Total Composite Values of Fibrous Components: Cellulose (7 %)		**Asbestos (ND)**					

20535 South Belshaw Avenue, Carson, CA 90746 | phone: 310.763.2374 / 800.813.9417 Fax: 310.763.4450 | https://falaboratories.sgs.com

Report Number: B360277

Client Name: FACS - Modesto **Date Printed:** 05/28/24

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
PJ81808-3A	12747325						
Layer: Tan Fibrous Material			**ND**				
Layer: White Drywall			**ND**				
Layer: Yellow Adhesive			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (70 %) Fibrous Glass (Trace)							
PJ81808-3B	12747326						
Layer: Tan Fibrous Material			**ND**				
Layer: White Drywall			**ND**				
Layer: Yellow Adhesive			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (70 %) Fibrous Glass (Trace)							
PJ81808-3C	12747327						
Layer: Tan Fibrous Material			**ND**				
Layer: White Drywall			**ND**				
Layer: Yellow Adhesive			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (25 %) Fibrous Glass (Trace)							
PJ81808-3D	12747328						
Layer: Tan Fibrous Material			**ND**				
Layer: Yellow Adhesive			**ND**				
Layer: Off-White Wallcovering			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (30 %) Fibrous Glass (Trace)							
PJ81808-3E	12747329						
Layer: Tan Fibrous Material			**ND**				
Layer: White Drywall			**ND**				
Layer: Yellow Adhesive			**ND**				
Layer: Off-White Wallcovering			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (75 %) Fibrous Glass (Trace)							
PJ81808-3F	12747330						
Layer: Tan Fibrous Material			**ND**				
Layer: White Drywall			**ND**				
Layer: Yellow Adhesive			**ND**				
Layer: Off-White Wallcovering			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (75 %) Fibrous Glass (Trace)							
PJ81808-3G	12747331						
Layer: Tan Fibrous Material			**ND**				
Layer: White Drywall			**ND**				
Layer: Yellow Adhesive			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (90 %) Fibrous Glass (Trace)							

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Report Number: B360277

Client Name: FACS - Modesto **Date Printed:** 05/28/24

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
PJ81808-4A	12747332						
Layer: Yellow Fibrous Material			**ND**				
Layer: Clear Adhesive			**ND**				
Layer: White Non-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (Trace) Fibrous Glass (95 %)							
PJ81808-4B	12747333						
Layer: Yellow Fibrous Material			**ND**				
Layer: Clear Adhesive			**ND**				
Layer: White Non-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (Trace) Fibrous Glass (95 %)							
PJ81808-4C	12747334						
Layer: Yellow Fibrous Material			**ND**				
Layer: Clear Adhesive			**ND**				
Layer: White Non-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (Trace) Fibrous Glass (95 %)							
PJ81808-5A	12747335						
Layer: Black Carpet with Pad			**ND**				
Layer: Yellow Mastic			**ND**				
Layer: Wood			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (2 %) Synthetic (85 %)							
PJ81808-5B	12747336						
Layer: Black Carpet with Pad			**ND**				
Layer: Yellow Mastic			**ND**				
Layer: Grey Non-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (Trace) Synthetic (85 %)							
PJ81808-5C	12747337						
Layer: Black Carpet with Pad			**ND**				
Layer: Yellow Mastic			**ND**				
Layer: Beige Non-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (Trace) Synthetic (85 %)							
PJ81808-6A	12747338						
Layer: Pink Semi-Fibrous Material		Chrysotile	**7 %**				
Total Composite Values of Fibrous Components:		**Asbestos (7%)**					
Cellulose (Trace)							

20535 South Belshaw Avenue, Carson, CA 90746 | phone: 310.763.2374 / 800.813.9417 Fax: 310.763.4450 | https://falaboratories.sgs.com

Report Number: B360277

Client Name: FACS - Modesto **Date Printed:** 05/28/24

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
PJ81808-7A	12747339						
Layer: Tan Mastic with Debris			**ND**				
Layer: Off-White Non-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components: Cellulose (Trace)		**Asbestos (ND)**					
PJ81808-7B	12747340						
Layer: Tan Mastic with Debris			**ND**				
Layer: Off-White Non-Fibrous Material			**ND**				
Layer: Wood			**ND**				
Total Composite Values of Fibrous Components: Cellulose (2 %)		**Asbestos (ND)**					
PJ81808-8A	12747341						
Layer: Blue Non-Fibrous Material			**ND**				
Layer: Black Mastic			**ND**				
Layer: Wood			**ND**				
Total Composite Values of Fibrous Components: Cellulose (7 %)		**Asbestos (ND)**					
PJ81808-8B	12747342						
Layer: Blue Non-Fibrous Material			**ND**				
Layer: Black Mastic			**ND**				
Layer: Grey Non-Fibrous Material			**ND**				
Layer: Wood			**ND**				
Total Composite Values of Fibrous Components: Cellulose (7 %)		**Asbestos (ND)**					
PJ81808-9A	12747343						
Layer: Grey Non-Fibrous Material			**ND**				
Layer: Tan Mastic			**ND**				
Total Composite Values of Fibrous Components: Cellulose (Trace)		**Asbestos (ND)**					
PJ81808-9B	12747344						
Layer: Grey Non-Fibrous Material			**ND**				
Layer: Tan Mastic			**ND**				
Layer: Off-White Non-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components: Cellulose (Trace)		**Asbestos (ND)**					
PJ81808-10A	12747345						
Layer: White Drywall			**ND**				
Layer: Tan Mastic			**ND**				
Layer: Off-White Non-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components: Cellulose (20 %) Fibrous Glass (Trace)		**Asbestos (ND)**					

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Report Number: B360277

Client Name: FACS - Modesto **Date Printed:** 05/28/24

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
PJ81808-10B	12747346						
Layer: White Drywall			**ND**				
Layer: Tan Mastic			**ND**				
Layer: Off-White Non-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components: Cellulose (20 %) Fibrous Glass (Trace)		**Asbestos (ND)**					
PJ81808-11A	12747347						
Layer: Dark Grey Non-Fibrous Mat'l			**ND**				
Layer: Grey Non-Fibrous Material			**ND**				
Layer: Yellow Mastic			**ND**				
Layer: Grey Non-Fibrous Material			**ND**				
Layer: Wood			**ND**				
Total Composite Values of Fibrous Components: Cellulose (Trace)		**Asbestos (ND)**					
PJ81808-11B	12747348						
Layer: Dark Grey Non-Fibrous Mat'l			**ND**				
Layer: Grey Non-Fibrous Material			**ND**				
Layer: Yellow Mastic			**ND**				
Layer: Grey Non-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components: Cellulose (Trace)		**Asbestos (ND)**					
PJ81808-12A	12747349						
Layer: White Non-Fibrous Material			**ND**				
Layer: Paint			**ND**				
Total Composite Values of Fibrous Components: Cellulose (Trace)		**Asbestos (ND)**					
PJ81808-12B	12747350						
Layer: Tan Fibrous Material			**ND**				
Layer: White Non-Fibrous Material			**ND**				
Layer: Paint			**ND**				
Layer: Grey Semi-Fibrous Material		Chrysotile	**2 %**				
Layer: Paint			**ND**				
Total Composite Values of Fibrous Components: Cellulose (2 %)		**Asbestos (2%)**					
PJ81808-13A	12747351						
Layer: Black Semi-Fibrous Tar			**ND**				
Total Composite Values of Fibrous Components: Cellulose (7 %)		**Asbestos (ND)**					
PJ81808-13B	12747352						
Layer: Black Semi-Fibrous Tar			**ND**				
Layer: Beige Non-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components: Cellulose (7 %)		**Asbestos (ND)**					

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Report Number: B360277

Client Name: FACS - Modesto **Date Printed:** 05/28/24

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer



Eric Cerecedo, Laboratory Supervisor, Carson Laboratory

Note: Limit of Quantification ('LOQ') = 1%. 'Trace' denotes the presence of asbestos below the LOQ. 'ND' = 'None Detected'.

Analytical results and reports are generated by SGS Forensic Laboratories (SGSFL) at the request of and for the exclusive use of the person or entity (client) named on such report. Results, reports or copies of same will not be released by SGSFL to any third party without prior written request from client. This report applies only to the sample(s) tested. Supporting laboratory documentation is available upon request. This report must not be reproduced except in full, unless approved by SGSFL. The client is solely responsible for the use and interpretation of test results and reports requested from SGSFL. This report must not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. Government. SGSFL is not able to assess the degree of hazard resulting from materials analyzed. SGS Forensic Laboratories reserves the right to dispose of all samples after a period of thirty (30) days, according to all state and federal guidelines, unless otherwise specified. All samples were received in acceptable condition unless otherwise noted.

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Appendix B

Lead Paint Chip Summary, Sample Chain-of-Custody, Laboratory Results Report and CDPH 8552 Form

Lead Paint Chip Summary (Lab Report #M260109) Merced City School District – Franklin Elementary School – Multiple Portables Survey Survey Date: May 16, 2024					
Sample Number	**Component Location**	**Component**	**Color**	**Substrate**	**Analytical Results (weight percent of lead)**
Pb01	**Room 23 – SE Side**	**Door**	**Red**	**Metal**	**0.36**
Pb02	Boys Restroom – NE Side	Siding	Tan	Metal	< 0.006
Pb03	Restroom Portable – East Side	Siding	Tan	Wood	< 0.006
Pb04	Room 28 – NW Side	Door	Brown	Metal	< 0.02
Pb05	**Room 27 – West Side**	**Door**	**Blue**	**Metal**	**0.007**
Pb06	Room 28 – West Side	Window Frame	Blue	Wood	< 0.006

SGS

Analysis Request Form (COC)

Client Name & Address: FACS Modesto, 313 Banner Court, Suite B, Modesto, California 95356

Client No.: MOD08

PO / Job#: PJ81808

Date: 5/17/2024

Turn Around Time: Same Day / 1Day / 2Day / 3Day / 4Day / 5Day

☐ PCM: ☐ NIOSH 7400A / ☐ NIOSH 7400B ☐ Rotometer

☐ PLM: ☐ Standard / ☐ Point Count 400 - 1000 / ☐ CARB 435

Contact: Chris Chipponeri

Phone: (209) 551-2000

E-mail: chris.c@facs.com

☐ TEM Air: ☐ AHERA / ☐ Yamate2 / ☐ NIOSH 7402
☐ TEM Bulk: ☐ Quantitative / ☐ Qualitative / ☐ Chatfield
☐ TEM Water: ☐ Potable / ☐ Non-Potable / ☐ Weight %
☐ TEM Dust: ☐ D5755 (microvac) / ☐ D6480 (wipe)

Site Name: Franklin Elementary School

☐ IAQ Particle Identification ☐ Opaques/Char (Wildfire)
☐ Limited Particle ID (Wildfire) ☐ Special Project

Site Location: 2739 Franklin Road, Merced, California

☒ Metals Analysis Matrix: Solid Method: Flame AA
Analytes: Lead

Comments: **Please email results**

☐ Silica in Air ☐ w/Gravimetry
☐ Quartz Only

Sample ID	Date / Time	Sample Location / Description	FOR AIR SAMPLES ONLY: Type	Time On/Off	Avg LPM	Total Time	Sample Area / Air Volume
PJ81808-Pb01	5/16/24	Red Paint on Metal Door Room 23 Southeast	A P C				
PJ81808-Pb02	5/16/24	Tan Paint on Metal Siding Bovs Restroom Northeast	A P C				
PJ81808-Pb03	5/16/24	Tan Paint on Wood Siding Restroom Portable East	A P C				
PJ81808-Pb04	5/16/24	Brown Paint on Metal Door Room 28 Northwest	A P C				
PJ81808-Pb05	5/16/24	Blue Paint on Metal Door Room 27 West	A P C				
PJ81808-Pb06	5/16/24	Blue Paint on Wood Window Frame Room 28 West	A P C				
			A P C				
			A P C				
			A P C				
			A P C				

Sampled By: Fernando Quintero Date/Time: 5/16/24

Shipped Via: ☒ Fed Ex ☐ UPS ☐ US Mail ☐ Courier ☐ Drop Off ☐ Other:

Relinquished By: [signature] Date / Time: 5/17/24

Relinquished By: Date / Time:

Relinquished By: Date / Time:

Received By: Date / Time: Condition Acceptable? ☐ Yes ☐ No

Received By: Date / Time: Condition Acceptable? ☐ Yes ☐ No

Received By: Date / Time: Condition Acceptable? ☐ Yes ☐ No

RECEIVED
MAY 20 0329
2024
BY: MCFX1030

SGS Built Environment may subcontract client samples to other SGS locations to meet client requests.

San Francisco Office: 3777 Depot Road, Suite 409, Hayward, CA 94545-2761 • Phone: 510/887-8828 • 800/827-3274
Los Angeles Office: 20535 South Belshaw Ave., Carson, CA 90746 • Phone: 310/763-2374 • 888/813-9417
Las Vegas Office: 3626 Sunset Road, Suite 100, Las Vegas, NV 89120 • Phone: 702/387-0040
Chicago Office: 3020 Woodcreek Drive, Suite C, Downers Grove, IL 60515 • Phone: 341/465-2464

Metals Analysis of Paints

(AIHA-LAP, LLC Accreditation, Lab ID #101762)

FACS - Modesto
Tyler Faison
313 Banner Court
Suite B
Modesto, CA 95356

Client ID: MOD08
Report Number: M260109
Date Received: 05/20/24
Date Analyzed: 05/22/24
Date Printed: 05/28/24
First Reported: 05/28/24

Job ID / Site: PJ81808; Merced City School District 2739 Franklin Road Merced CA 95340
Date(s) Collected: 5/17/2024

SGSFL Job ID: MOD08
Total Samples Submitted: 6
Total Samples Analyzed: 6

Sample Number	Lab Number	Analyte	Result	Result Units	Reporting Limit*	Method Reference
PJ81808-PB01	30939402	Pb	0.36	wt%	0.04	EPA 3050B/7000B
PJ81808-PB02	30939403	Pb	< 0.006	wt%	0.006	EPA 3050B/7000B
PJ81808-PB03	30939404	Pb	< 0.006	wt%	0.006	EPA 3050B/7000B
PJ81808-PB04	30939405	Pb	< 0.02	wt%	0.02	EPA 3050B/7000B
PJ81808-PB05	30939406	Pb	0.007	wt%	0.006	EPA 3050B/7000B
PJ81808-PB06	30939407	Pb	< 0.006	wt%	0.006	EPA 3050B/7000B

* The Reporting Limit represents the lowest amount of analyte that the laboratory can confidently detect in the sample, and is not a regulatory level. The Units for the Reporting Limit are the same as the Units for the Final Results.

Kevin Poon

Kevin Poon, Laboratory Supervisor, Hayward Laboratory

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Note* Sampling data used in this report was provided by the client as noted on the associated chain of custody form.

LEAD HAZARD EVALUATION REPORT

Section 1 — Date of Lead Hazard Evaluation May 16, 2024

Section 2 — Type of Lead Hazard Evaluation (Check one box only)

☑ Lead Inspection ☐ Risk assessment ☐ Clearance Inspection ☐ Other (specify) _____

Section 3 — Structure Where Lead Hazard Evaluation Was Conducted

Address [number, street, apartment (if applicable)]	City	County	Zip Code
2739 Franklin Road	Merced	Merced	95348

Construction date (year) of structure	Type of structure	Children living in structure?
Unknown	☐ Multi-unit building ☑ School or daycare ☐ Single family dwelling ☐ Other_____	☐ Yes ☑ No ☐ Don't Know

Section 4 — Owner of Structure (if business/agency, list contact person)

Name	Telephone number
Bryan Behn | Merced City School District	(209) 385-6332

Address [number, street, apartment (if applicable)]	City	State	Zip Code
2105 Wardrobe Avenue	Merced	CA	95340

Section 5 — Results of Lead Hazard Evaluation (check all that apply)

☑ No lead-based paint detected ☐ Intact lead-based paint detected ☐ Deteriorated lead-based paint detected

☑ No lead hazards detected ☐ Lead-contaminated dust found ☐ Lead-contaminated soil found ☐ Other_____

Section 6 — Individual Conducting Lead Hazard Evaluation

Name	Telephone number
Chris Chipponeri	(209) 484-4648

Address [number, street, apartment (if applicable)]	City	State	Zip Code
313 Banner Court, Suite B	Modesto	CA	95356

CDPH certification number	Signature	Date
I/A LRC-00000782		May 30, 2024

Name and CDPH certification number of any other individuals conducting sampling or testing (if applicable)

Trevor Leitz ST LRC-00003432

Section 7 — Attachments

A. A foundation diagram or sketch of the structure indicating the specifc locations of each lead hazard or presence of lead-based paint;
B. Each testing method, device, and sampling procedure used;
C. All data collected, including quality control data, laboratory results, including laboratory name, address, and phone number.

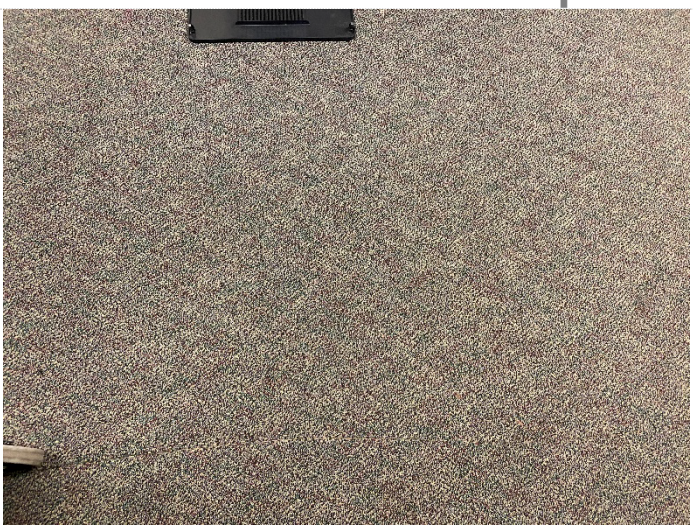
First copy and attachments retained by inspector

Second copy and attachments retained by owner

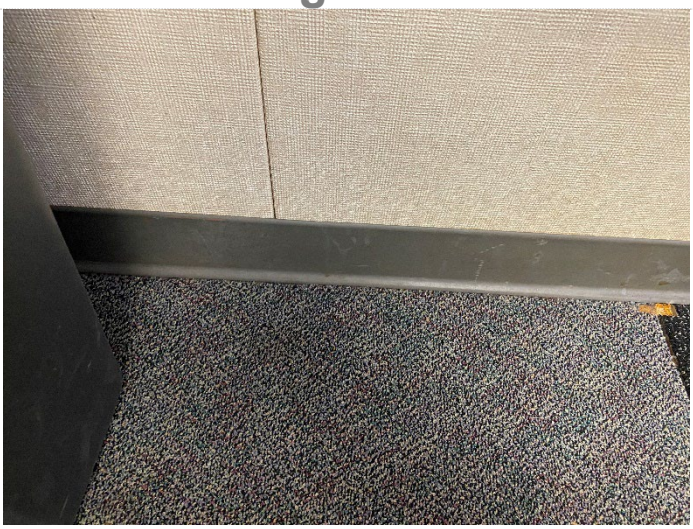
Third copy only (no attachments) mailed or faxed to:

California Department of Public Health
Childhood Lead Poisoning Prevention Branch Reports
850 Marina Bay Parkway, Building P, Third Floor
Richmond, CA 94804-6403
Fax: (510) 620-5656

Appendix C
Site Photos and Sample Location Drawing



Carpet & Mastic – Purple/Green Multi



4” Baseboard & Mastic – Grey



Tackboard



2x4 FCP – Fiberglass Pinhole Fissure



Carpet & Mastic – Black Walk-Off



Wood & Mastic



Linoleum & Mastic – Blue w/ Specks



6” Baseboard & Mastic – Grey



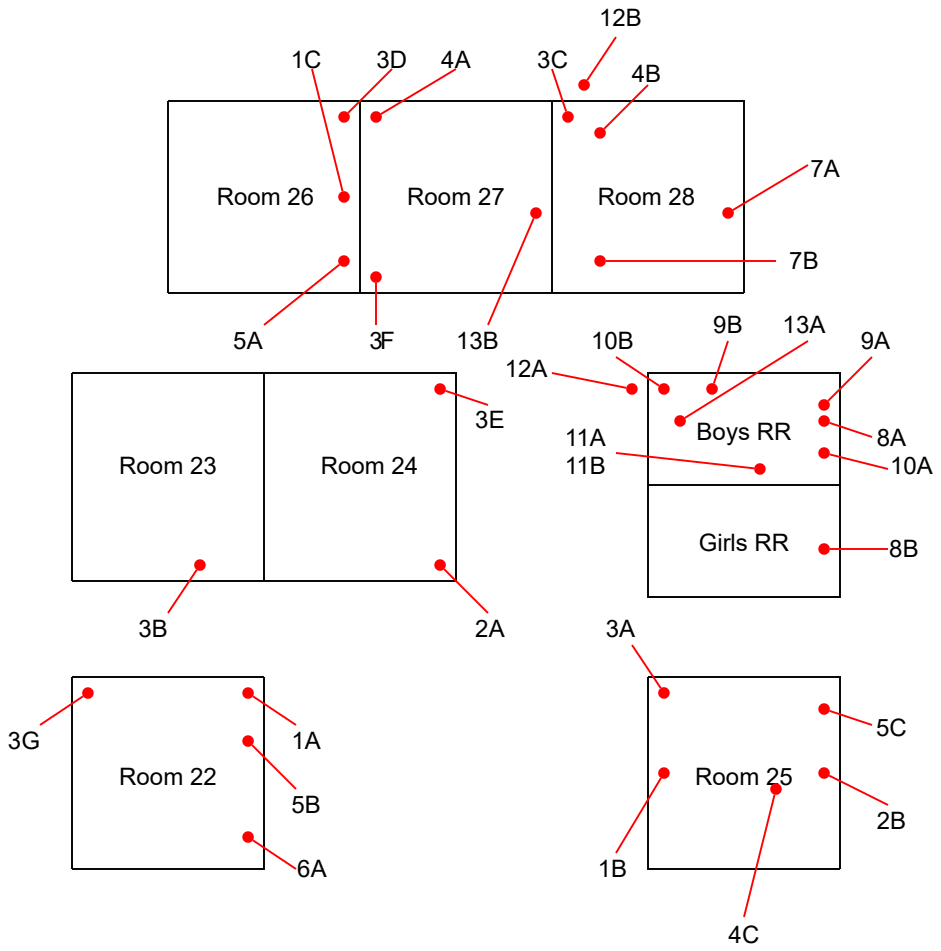
FRP Rough – White



Linoleum & Mastic – Grey Pebble



Bolt Mastic



FACS 35 Forensic Analytical Consulting Services
CELEBRATING 35 YEARS OF EXCELLENCE · 1986–2021

313 Banner Court, Suite B
Modesto, CA 95356

N

Sample Location

Merced City School District
2105 Wardrobe Avenue
Merced, CA 95340

Franklin Elementary School

LOCATION:
2739 Franklin Road
Merced, CA 95348

DRAWN BY:
Trevor Leitz

FACS PROJECT No.:
PJ81808

This ia a design drawing and is the property of Forensic Analytical Consulting Services, Inc. It is not intended to replace required architectural or engineering plans.

Appendix D
Certifications of Personnel and Laboratories

STATE OF CALIFORNIA Gavin Newsom, Governor

DEPARTMENT OF INDUSTRIAL RELATIONS
Division of Occupational Safety and Health-Asbestos Certification
1750 Howe Avenue, Suite 460
Sacramento, CA 95825
(916) 574-2993 Office http://www.dir.ca.gov/dosh/asbestos.html actu@dir.ca.gov

910116682T **453**

Forensic Analytical Consulting Services **January 18, 2024**
Trevor T Leitz
313 Banner Court, Suite B
Modesto CA 95356

Dear Certified Asbestos Consultant or Technician:

Enclosed is your certification card. **To maintain your certification, you must abide by the rules printed on the back of the certification card.**

Your certification is valid for a period of one year. If you wish to renew your certification, you must apply for renewal at least 60 days before the expiration date shown on your card. [8 CCR 341.15(h)(1)].

Please hold and do not send copies of your required AHERA refresher renewal certificates to our office until you apply for renewal of your certification.

Certificates must be kept current if you are actively working as a CAC or CSST. The grace period is only for those who are not actively working as an asbestos consultant or site surveillance technician.

Please contact our office at the above address or email w any changes in your contact/mailing information within 15 days of the change.

Sincerely,

Kevin Graulich
Principal Safety Engineer

Attachment: Certification Card

cc: File



Renewal – Card Attached

Forensic Analytical Consulting Services, Inc.

This is to confirm that

Trevor Leitz

Has attended the four-hour

AHERA Refresher Course for Asbestos Inspectors

And has completed the requisite training for

asbestos accreditation under TSCA Title II

September 05, 2023

Certificate Number: FACSBIR1511

Valid Until: 9/05/24

Cal/OSHA Approval Number: CA-025-06

FACS
Forensic Analytical
Consulting Services

Fred J. Vinciguerra, Chief Executive Officer
Forensic Analytical Consulting Services,Inc.
21228 Cabot Blvd, Hayward, CA 94545
(800) 677-1483

California Department of PublicHealth

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH

LEAD-RELATED CONSTRUCTION CERTIFICATE

INDIVIDUAL:	CERTIFICATE TYPE:	NUMBER:	EXPIRATION DATE:
 Trevor Leitz	Lead Sampling Technician	LRC-00003432	10/4/2024

Disclaimer: This document alone should not be relied upon to confirm certification status. Compare the individual's photo and name to another valid form of government issued photo identification. Verify the individual's certification status by searching for Lead-Related Construction Professionals at www.cdph.ca.gov/programs/clppb or calling (800) 597-LEAD

STATE OF CALIFORNIA Gavin Newsom, Governor

DEPARTMENT OF INDUSTRIAL RELATIONS
Division of Occupational Safety and Health-Asbestos Certification Unit
1750 Howe Avenue, Suite 460
Sacramento, CA 95825
(916) 574-2993 Office http://www.dir.ca.gov/dosh/asbestos.html actu@dir.ca.gov

310047532T **486** **490**

May 20, 2024

Fernando Quintero
3332 Berg Avenue, #2
Denair CA 95316

Dear Certified Asbestos Consultant or Technician:

Enclosed is your certification card. **To maintain your certification, you must abide by the rules printed on the back of the certification card.**

Your certification is valid for a period of one year. If you wish to renew your certification, you must apply for renewal at least 60 days before the expiration date shown on your card. [8 CCR 341.15(h)(1)].

Please hold and do not send copies of your required AHERA refresher renewal certificates to our office until you apply for renewal of your certification.

Certificates must be kept current if you are actively working as a CAC or CSST. The grace period is only for those who are not actively working as an asbestos consultant or site surveillance technician.

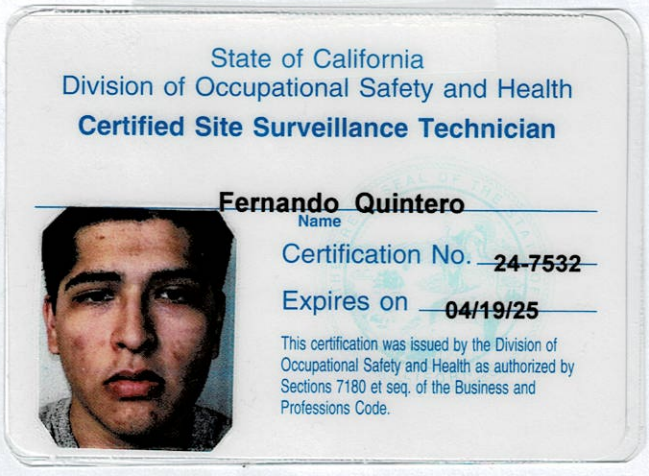
Please contact our office at the above address or email w any changes in your contact/mailing information within 15 days of the change.

Sincerely,

Kevin Graulich
Principal Safety Engineer

Attachment: Certification Card

cc: File



Renewal – Card Attached

Forensic Analytical Consulting Services, Inc.

This is to confirm that

Fernando Quintero

Has attended the twenty-four hour

AHERA Initial Course for Asbestos Inspectors

And has completed the requisite training and passed the exam for

asbestos accreditation under TSCA Title II

June 12 - June 14, 2023

Certificate Number: FACSBII252
Valid Until: June 14, 2024

Cal/OSHA Approval Number: CA-025-05

FACS
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Consulting Services

Fred J. Vinciguerra, Chief Executive Officer
Forensic Analytical Consulting Services, Inc.
21228 Cabot Blvd. Hayward, CA 94545
(800) 677-1483

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH

LEAD-RELATED CONSTRUCTION CERTIFICATE

INDIVIDUAL:	CERTIFICATE TYPE:	NUMBER:	EXPIRATION DATE:
 **Fernando Quintero**	Lead Sampling Technician	LRC-00011951	10/30/2024

Disclaimer: This document alone should not be relied upon to confirm certification status. Compare the individual's photo and name to another valid form of government issued photo identification. Verify the individual's certification status by searching for Lead-Related Construction Professionals at www.cdph.ca.gov/programs/clppb or calling (800) 597-LEAD

STATE OF CALIFORNIA Gavin Newsom, Governor

DEPARTMENT OF INDUSTRIAL RELATIONS
Division of Occupational Safety and Health-Asbestos Certification Unit
1750 Howe Avenue, Suite 460
Sacramento, CA 95825
(916) 574-2993 Office http://www.dir.ca.gov/dosh/asbestos.html actu@dir.ca.gov

005174633C **339**

May 20, 2024

Christopher J Chipponeri
1401 Louise Avenue
Modesto CA 95350

Dear Certified Asbestos Consultant or Technician:

Enclosed is your certification card. **To maintain your certification, you must abide by the rules printed on the back of the certification card.**

Your certification is valid for a period of one year. If you wish to renew your certification, you must apply for renewal at least 60 days before the expiration date shown on your card. [8 CCR 341.15(h)(1)].

Please hold and do not send copies of your required AHERA refresher renewal certificates to our office until you apply for renewal of your certification.

Certificates must be kept current if you are actively working as a CAC or CSST. The grace period is only for those who are not actively working as an asbestos consultant or site surveillance technician.

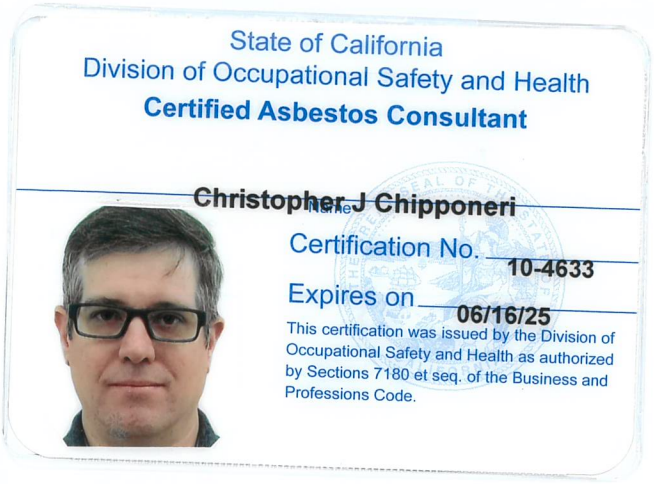
Please contact our office at the above address or email w any changes in your contact/mailing information within 15 days of the change.

Sincerely,

Kevin Graulich
Principal Safety Engineer

Attachment: Certification Card

cc: File



Renewal – Card Attached

Forensic Analytical Consulting Services, Inc.

This is to confirm that

Chris Chipponeri

Has attended the four-hour

AHERA Refresher Course for Asbestos Inspectors

And has completed the requisite training for

asbestos accreditation under TSCA Title II

September 05, 2023

Certificate Number: FACSBIR1518

Valid Until: 9/05/24

Cal/OSHA Approval Number: CA-025-06

FACS
Forensic Analytical Consulting Services

Fred J. Vinciguerra, Chief Executive Officer
Forensic Analytical Consulting Services,Inc.
21228 Cabot Blvd, Hayward, CA 94545
(800) 677-1483

California Department of PublicHealth

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH

LEAD-RELATED CONSTRUCTION CERTIFICATE

INDIVIDUAL:	CERTIFICATE TYPE:	NUMBER:	EXPIRATION DATE:
 **Chris Chipponeri**	Lead Inspector/Assessor	LRC-00000782	6/20/2025

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ASBESTOS FIBER ANALYSIS — NVLAP LAB CODE 101459-0

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

Code	*Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

For the National Voluntary Laboratory Accreditation Program

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Cheryl O. Morton

Cheryl O Morton
Managing Director, AIHA Laboratory Accreditation Programs, LLC

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ENGINEERING SERVICES, INC.

GEOTECHNICAL INVESTIGATION AND GEOLOGIC-SEISMIC HAZARDS EVALUATION REPORT PROPOSED PHASE 3 MODULAR BUILDING ADDITION FRANKLIN ELEMENTARY SCHOOL 2736 FRANKLIN ROAD MERCED, CALIFORNIA

Prepared for:

Merced City School District
444 W 23rd Street
Merced, California 95340

September 20, 2024

TES No. 240426.001

GEOTECHNICAL & ENVIRONMENTAL ENGINEERING – CONSTRUCTION TESTING & INSPECTION

Prepared For:

Merced City School District
444 W 23rd Street
Merced, California 95340

GEOTECHNICAL INVESTIGATION AND GEOLOGIC-SEISMIC HAZARDS EVALUATION REPORT
PROPOSED PHASE 3 MODULAR BUILDING ADDITIONS
FRANKLIN ELEMENTARY SCHOOL
2736 FRANKLIN ROAD
MERCED, CALIFORNIA

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**GEOTECHNICAL INVESTIGATION AND GEOLOGIC-SEISMIC HAZARDS EVALUATION REPORT
PROPOSED PHASE 3 MODULAR BUILDING ADDITIONS
FRANKLIN ELEMENTARY SCHOOL
2736 FRANKLIN ROAD
MERCED, CALIFORNIA**

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1 INTRODUCTION

1.1 GENERAL

This report presents the results of a geotechnical investigation for the proposed Phase 3 Modular Building Addition to be constructed at the existing Franklin Elementary. The purpose of the investigation was to explore and evaluate the subsurface conditions at the site to develop geotechnical recommendations for project design and construction.

The Vicinity Map, presented on Figure 1, shows the general location of the project and the Site Map, presented on Figure 2, shows the proposed improvements and the boring locations for this investigation.

A geologic-seismic hazards evaluation was prepared concurrently with the geotechnical investigation and is incorporated into Sections 3 through 5 of this report. References reviewed during preparation of the geologic and seismic hazards section of this report are listed in Section 10, “References”.

1.2 LOCATION

The project is located in northern Merced County, at 2736 Franklin Road in Merced, California. Based on the Merced, California 7 ½-minute quadrangle topographic map, the site lies within the central area of Section 15, R13E and T7S. The elevation of the site is approximately 160 feet above the Mean Sea Level. Based on the USGS 7½-minute topographic map, the site coordinates are approximately:

Latitude: 37.3271° N
Longitude: 120.5400° W

1.3 PROPOSED CONSTRUCTION

The project involves the design and construction of two (2) modular building wings containing 9 classrooms and 2 utility rooms. The estimated square footage of each modular building will be

7,827 and 6,374 square feet. Additionally, a 1,688 square foot solar shade structure is proposed within the school grounds. The modular buildings are anticipated to consist of single-story structures supported on shallow concrete foundations and slab-on-grade floors. Maximum wall and column loads are estimated to be less than 3 kips per foot and 30 kips, respectively. The shade structure is anticipated to be supported on isolated pier or spread footings with maximum loads less than 60 kips. Appurtenant improvements will include underground utilities, concrete flatwork, and landscape. The site appears to be relatively flat, therefore we estimate that cut and fill depths will be less than 2 feet.

1.4 PURPOSE AND SCOPE OF SERVICES

The purpose of the investigation and evaluation was to explore the site subsurface conditions and evaluate pertinent geologic and seismic data to develop recommendations and opinions to aid in project design, approval and construction. The scope of services consisted of a field exploration program, laboratory testing, design analysis, and preparation of this written report as described in **TECHNICON's** proposal, dated March 20, 2024 (TES No. GP24-058). This Geotechnical Investigation and Geologic-Seismic Hazards Evaluation Report includes the following:

- ❑ A description of the proposed project, including a vicinity map showing the location of the site and a site plan showing the exploration locations;
- ❑ A description of the site surface and subsurface conditions encountered during the field investigation, including boring logs;
- ❑ A summary of the field exploration and laboratory testing program;
- ❑ Comments on regional and site engineering geology and seismology;
- ❑ Determination of peak horizontal ground surface acceleration utilizing the mapped spectral acceleration parameters of the 2022 California Building Code (CBC);
- ❑ Discussion of geologic hazards affecting the site and project, including liquefaction, seismically induced settlement, landslides, flooding, etc;
- ❑ Site preparation and earthwork, including the use of on-site soils for engineered fill and recommended import fill specifications;
- ❑ Spread footing design, including bearing capacity of foundation soil for sustained loading and total combined loading, embedment depths and anticipated total settlements;
- ❑ Resistance of lateral loads, including passive pressure and coefficient of friction;
- ❑ Design of pier foundations including axial and lateral capacity;

- ❑ Design factors for earth retaining structures;
- ❑ Design of concrete slabs-on-grade for buildings, including modulus of subgrade reaction;
- ❑ Comments on the corrosion potential of on-site soil to buried metal and concrete;
- ❑ Comments to aid in the design of on-site drainage.

2 FIELD EXPLORATION AND LABORATORY TESTING

2.1 FIELD EXPLORATION

The field exploration, conducted on July 26, 2024 consisted of drilling five (5) exploratory test borings, and a site reconnaissance by a staff engineer. The test borings were drilled with a SIMCO 2800 truck-mounted drill rig using 4-inch diameter solid flight auger drilling techniques and extended to depths of 16.5, 21.5, and 56.5 feet below existing ground surface (bgs). The approximate locations of the test borings are indicated on the Site Map, Figure 2.

The soils encountered in the borings were visually classified in the field and a continuous log was recorded. Relatively undisturbed samples were collected from the test borings at selected depths by driving a 2.5-inch I.D. split barrel sampler containing brass liners into the undisturbed soil with a 140-pound automatic hammer free falling a distance of 30 inches. In addition, samples of the subsurface soils were obtained using a 1.4-inch I.D. standard penetrometer, driven 18 inches in accordance with ASTM D1586 test procedures. The sampler was used without liners. Resistance to sampler penetration was noted as the number of blows per foot over the last 12 inches of sampler penetration on the boring logs. The blow counts listed in the boring logs have not been corrected for the effects of overburden pressure, rod length, sampler size, boring diameter, or hammer efficiency. Bulk samples were also retained from auger cuttings of the near surface soils at selected test boring locations.

2.2 FIELD AND LABORATORY TESTING

Penetration rates, determined in general accordance with ASTM D1586, were used to aid in evaluating the consistency, compression, and strength characteristics of the foundation soils.

Laboratory tests were performed on selected near surface samples to evaluate their physical characteristics. The following laboratory tests were used to develop the design geotechnical parameters:

- ❑ Unit weight (ASTM D2937)
- ❑ Moisture Content (ASTM D2216)
- ❑ Sieve Analysis (ASTM C136)
- ❑ Expansion Index (ASTM D4829)

- ❑ Direct Shear (ASTM D3080)
- ❑ Soluble Sulfate and Soluble Chloride Contents (California Test Method No. 417 & 422)
- ❑ pH and Minimum Resistivity (California Test Method No. 643)
- ❑ Collapse Potential (ASTM D5333)

The dry density and moisture content test results are shown on the boring logs in Appendix A. The soluble sulfate, soluble chloride, pH, and minimum resistivity are discussed in Section 7.6, “Corrosion Potential”. The remaining test results are provided in Appendix B.

3 SITE AND GEOLOGIC CONDITIONS

3.1 REGIONAL GEOLOGY

The site lies within the central east portion of the San Joaquin Valley, within the Great Valley geomorphic province of California (CGS, 2002). The Central Valley is between the Sierra Nevada geomorphic province to the east, and the Coast Range geomorphic province to the west. The thick sequence of sediments that form the valley floor were eroded from these adjacent mountain regions and have been accumulating since the Jurassic period, about 160 million years ago.

The regional geologic structure forms an asymmetrical trough, which is deepest near the western margin. The surficial sediments filling the trough include deposits of alluvial fans, flood plains, marshes, and lakes (Croft, 1972). The regional geologic map is presented on Figure 3.

3.2 AREA AND SITE GEOLOGY

The geology at the site is mapped as Pleistocene aged Modesto Formation (Qm), described as arkosic alluvium of aeolian, alluvial, and terrace deposits. The soil subgrade characteristics encountered during the field investigation (i.e. soil type, blow count, etc.) are representative of these sediments. Figure 4 presents a site-specific geologic map of the project.

3.3 SURFACE CONDITIONS

At the time of investigation, the project site was occupied by modular buildings and landscaped areas within the central portion of the existing Franklin Elementary School. The campus is generally bounded by existing residential subdivisions to the north, east and south, and Franklin Road to the west. The overall site topography is relatively flat and approximately the same elevation as the surrounding grade.

3.4 EARTH MATERIALS

The subsurface soils consist of Pleistocene aged Modesto Formation (Qm). The earth material encountered by the subsurface exploration consisted of silty sand in the upper 4 to 13 feet, underlain by laterally discontinuous layers of sandy clay, clayey sand, silty sand, and poorly graded sand extending to the maximum depth explored, 56.5 feet bgs. The granular soils

generally had a relative density of medium dense to very dense and the fine grained soils had a consistency of medium stiff to hard.

The above is a general description of the earth material profile. A more detailed representation of the stratigraphy at the specific exploration locations is provided on the boring logs in Appendix A and the cross section on Figure 5.

3.5 GROUNDWATER CONDITIONS

Groundwater was not encountered within the borings to a depth of 56.5 feet bgs. The California Department of Water Resources “Sustainable Groundwater Management Agency Data Viewer” Spring 2023, indicates the current groundwater depth in the area exceeds approximately 100 feet bgs. Research utilizing the California Department of Water Resources (DWR) website shows a nearby well with recorded data to be approximately 0.2 miles to the north of the project site (Well No. 07S13E15D001M). Based on the groundwater elevation data collected at this well measurements historic high groundwater recorded in 1958 was approximately 5 feet bgs.

Considering groundwater was not encountered at the time of drilling, a design groundwater depth of 5 feet is recommended for project planning, design, and the evaluation of liquefaction and any seismically induced effects. This depth coincides with water elevations recorded in 1958.

Groundwater conditions at the site could change in the future due to variations in rainfall, groundwater withdrawal, construction activities, or other factors not apparent at the time our test borings were made. However, groundwater is not anticipated to impact construction.

4 FAULTING AND SEISMICITY

4.1 HISTORICAL SEISMICITY

The project site is in a region traditionally characterized by moderate seismic activity. Seismic activity of the site was researched using information obtained from the U.S. Geologic Survey (USGS) and California Geologic Survey (CGS) websites, a catalog by the Advanced National Seismic System (ANSS) and Caltrans Acceleration Response Spectra (ARS).

Some of the historical earthquake events that caused significant shaking at the site are listed in Table 4.1-1.

TABLE 4.1-1

SIGNIFICANT REGIONAL EARTHQUAKE EVENTS

Earthquake Name	Year	Distance from Site (miles)	Magnitude (Mw)
Coalinga	1983	123	6.4
Great Fort Tejon	1857	126	7.9
Parkfield	1922	146	6.5
Owens Valley	1872	226	6.5

Epicenters of significant earthquakes ($M \geq 5.5$) within the vicinity of the site are shown on Figure 6. Data for earthquakes that occurred from 1800 to 2022 have been obtained from the Significant California Earthquakes website (CGS, 2019) and a composite catalog by the ANSS. The ANSS catalog is a worldwide earthquake catalog which is created by merging the master earthquake catalogs from contributing ANSS member networks and then removing duplicate events, or non-unique solutions from the same event. The ANSS network includes the Northern and Southern California Seismic Networks, the Pacific Northwest Seismic Network, the University of Nevada, Reno Seismic Network, the University of Utah Seismographic Stations, and the United States National Earthquake Information Service. The earthquake database also consists of earthquake records between 1800 and 1900 from Seeburger and Bolt (1976) and Toppozada et al. (1978 and 1981).

4.2 FAULTS LOCAL TO THE PROPOSED SITE

The site is not located in an Alquist-Priolo Earthquake Fault Zone as established by the Alquist-Priolo Fault Zoning Act (Section 2622 of Chapter 7.5, Division 2 of the California Public Resources Code).

The CGS Fault Activity Map of California (2010) was reviewed to determine if identified active faults are located on or near the subject site. According to the map, no identified active faults are located on or near the subject site. Locations of active and late Quaternary faults in the area with respect to the subject site are shown on Figure 7, Regional Fault Activity Map (obtained from the Fault Activity Map of California, Jennings, Bryant and Saucedo, 2010).

Based on review of published data and current understanding of the geologic framework and tectonic setting of the proposed improvements, the primary sources of seismic shaking at this site are listed in Table 4.2-1. The table also provides the fault type, distance from the site, and maximum moment magnitude (M_W). A major seismic event on these or other nearby faults may cause ground shaking at the site. Based on the deterministic ground acceleration, the San Andreas Fault, located west of the site, is considered the governing fault.

TABLE 4.2-1
PRIMARY SOURCES OF SEISMIC SHAKING

Fault Name	Fault Type	Distance from Site (miles)	Magnitude (Mw)
Great Valley	Thrust	28	7.1
Greenville	Right Lateral/ Strike Slip	50	7.5
Ortigalita	Right Lateral/ Strike Slip	53	6.7
San Andreas	Right Lateral/ Strike Slip	62	7.9

4.3 SITE CLASS

Based on the field exploration, the site soil is classified as Site Class D as presented in ASCE 7-16 based on the average Standard Penetration Tests (N value) at the project site. Site Class D is defined as a stiff soil profile with shear wave velocities between 600 feet/sec and 1,200 feet/sec,

or Standard Penetration Resistance (N) between 15 to 50 blows/foot, or undrained shear strength (S_u) between 1,000 to 2,000 psf for the upper 100 feet.

4.4 GENERAL PROCEDURE SEISMIC DESIGN CRITERIA

In accordance with CBC 1613A.2 a general procedure ground motion analysis was performed. USGS seismic design mapped values were obtained for the project site utilizing a Site Class D, and site coordinates from the Structural Engineers Association of California (SEAOC) website (http://seismicmaps.org). The values obtained are provided in the table below.

TABLE 4.4-1
2022 CBC/ASCE 7-16 GENERAL PROCEDURE GROUND MOTION PARAMETERS

Seismic Item	Design Value	Seismic Item	Design Value
Site Class	D	Seismic Design Category	D
S_S	0.575	S_{MS}	0.770
S_1	0.238	S_{M1}	0.506
Site Coefficient, F_v	2.124*	S_{DS}	0.513
Site Coefficient, F_a	1.340	S_{D1}	0.337
T_S	0.657		

*This value of F_v should only be used for calculation of T_s. See Section 11.4.8 of ASCE 7-16

A probabilistic seismic hazards analysis (PSHA) procedure was performed using the USGS Unified Hazard Tool to estimate the earthquake magnitude. The program allows user input of the project site coordinates and produces the expected peak ground motions for selected probability of exceedance (e.g., return periods). Based on a probability of exceedance of 2 percent in 50 years, the USGS Unified Hazard Tool determined a peak ground acceleration of 0.346g and a weighted magnitude of Mw = 6.35.

4.5 SITE SPECIFIC SEISMIC DESIGN CRITERIA

In accordance with ASCE 7-16 11.4.8, since the project is in a site class D and the S_1 value is greater than 0.2 (0.238g) a site-specific ground motion hazard analysis was performed. The analysis followed the requirements of ASCE 7-16, Sections 21.2 through 21.5, as well as ASCE 7-16, Supplement No. 1 and No. 3, and 2022 CBC 1830A.6.

The following steps were utilized for determining the site-specific ground motion parameters: Seismic design parameters were obtained for the project site utilizing a Site Class D, and site coordinates from the Structural Engineers Association of California (SEAOC) website (http://seismicmaps.org). The USGS Unified Hazard Tool and the Risk-Targeted Ground Motion calculator was used to calculate the probabilistic ground motion response spectrum in accordance with ASCE 7-16 Section 21.2.1.2 Method 2. The 2014 NGA West2 – GMPEs worksheet from the Pacific Earthquake Engineering Research Center was then used to calculate deterministic spectral response acceleration as an 84th-percentile 5% damped spectral response acceleration in the maximum horizontal direction by using fault parameters and magnitude area relationships given by the USGS Unified Hazard Tool in accordance with ASCE 7-16 Section 21.2.2. Supplement No. 3 indicates that projects located in Site Class D should increase S_{M1} by 50 percent in Equation 11.4-2. This increase results in a 50 percent increase of S_{D1} in Equation 11.4-4. These increased values are to be used for all applications and formulation of the design response spectrum. The Site-Specific MCE_R was then calculated by a single factor such that the maximum response spectral acceleration equals $1.5F_a$, with F_a determined using Table 11.4.1 in the ASCE 7-16. In accordance with ASCE 7-16 Section 21.3, the design spectral response had to be checked that no period shall be taken as less than 80% of S_a determined in accordance with Section 11.4.6, where F_a is determined using Table 11.4.1 and F_V is taken as 2.4 for $S_1 < 0.2$ or 2.5 for $S_1 >$ or equal to 0.2. After checking design spectrum is greater than 80% of code-based spectrum for all periods, using the design spectrum graph, design acceleration parameters such as S_{DS} is taken as 90% of max S_a between periods T=0.2 and 5 seconds and parameter S_{D1} taken as the maximum value of the product, TS_a, for periods from 1 to 5 seconds for sites with $V_s < 365.76$ m/s in accordance with ASCE 7-16 Section 21.4. The parameters S_{MS} and S_{M1} are then taken as 1.5 times S_{DS} and S_{D1}, respectively. Lastly, the maximum considered earthquake geometric mean peak ground acceleration is taken by comparing deterministic peak ground acceleration from 84th spectral acceleration at T=0.01 seconds to $0.5F_{PGA}$, following with the greater of those two values being compared to the probabilistic peak ground acceleration, with the lesser of the two values being the site-specific peak ground acceleration (0.346) in accordance with ASCE 7-16, Section 21.5. Based on this analysis, a peak ground acceleration of 0.346g is recommended for the evaluation of liquefaction. The site-specific ground motion analysis is attached.

TABLE 4.5-1
2022 CBC/ASCE 7-16 SITE SPECIFIC GROUND MOTION PARAMETERS

Seismic Item	Design Value	Seismic Item	Design Value
Site Class	D	Seismic Design Category	D
S_S	0.575	S_{MS}	0.918
S_1	0.238	S_{M1}	0.720
Site Coefficient, F_v	2.500	S_{DS}	0.612
Site Coefficient, F_a	1.340	S_{D1}	0.480
T_S	1.160		

5 GEOLOGIC AND SEISMIC HAZARDS

5.1 GENERAL

A discussion of specific geologic hazards that could impact the site is included below. The hazards considered include: surface fault rupture; seismically induced ground failures (liquefaction, lateral spreading, dynamic compaction, and landslides), general flooding and seismically induced flooding (tsunami, seiche, and dam failure); and hydrocompactive, expansive, and corrosive soils.

5.2 SURFACE FAULT RUPTURE

The site is not in an Alquist-Priolo Earthquake Fault Zone. Based upon the reviewed geologic and seismologic reports, maps, and aerial photographs, no mapped active faults cross or project toward the site. Additionally, no evidence of active faulting was visible on the site during our site reconnaissance. Therefore, it is our opinion that the potential for fault-related surface rupture at the project site is low.

5.3 SEISMICALLY INDUCED GROUND FAILURE

5.3.1 Liquefaction

For soil liquefaction due to ground shaking, and possible associated effects to occur, it is generally accepted that four conditions are required:

- The subsurface soils are in a relatively loose state,
- The soils are saturated,
- The soils are fine, granular, and uniform, and
- Ground shaking of sufficient intensity to act as a triggering mechanism.

Geologic age also influences the potential for liquefaction. Sediments deposited within the past few thousand years are generally much more susceptible to liquefaction than older Holocene sediments; Pleistocene sediments are often more resistant; and pre-Pleistocene sediments are generally immune to liquefaction (Youd, et al., 2001).

Saturated granular sediments can experience liquefaction if subject to seismically induced ground motion of sufficient intensity and duration. Liquefaction analysis used procedures by

Youd et. al. (2001) and considered the relative density and fines content of the granular sediments. The analysis considered a historical high design groundwater depth of 5 feet bgs and measured groundwater depth of greater than 50 feet bgs, ground acceleration (PGA_M) of 0.346g, and earthquake moment magnitude, Mw = 6.6 which is based on the largest characteristic magnitude as presented in the UCERF2 and UCERF 3 fault models.

The coarse-grained layers of sand were evaluated for potential liquefaction using the cyclic liquefaction analysis model by Youd et. al. (2001). Liquefaction analysis performed on the granular sediments indicates that liquefaction is anticipated to occur between 53 and 56.5 feet below ground surface. The estimated seismically induced settlement due to liquefaction is anticipated to be minimal, less than 0.25-inch. Therefore, no mitigation against liquefaction and/or settlement is necessary. The liquefaction and settlement calculations are included in Appendix E.

5.3.2 Dynamic Compaction

Another type of seismically induced ground failure, which can occur as a result of seismic shaking, is seismic settlement. Such phenomena typically occur in unsaturated, loose granular material or uncompacted fill soils. Dry sand settlement will be low (approximately 0.22-inch) and mitigation measures are not warranted.

5.3.3 Landslides and Ground Failure

According to the Merced County General Plan (MCGP, 2030), habitable structures are prohibited on areas of unconsolidated landslide debris or in areas vulnerable to landslides. Since the project site is located on relatively flat terrain, the potential for landslides or other slope failures from earthquake-induced ground shaking is unlikely. Strong shaking also has the potential for activating slope failures on creek banks (lurch cracking) and tension cracking in areas underlain by loose, low density soil such as uncompacted fill. Since the project is not located near any creek banks, the potential for landslides or other slope failures from earthquake-induced ground shaking is considered unlikely.

communities and developments. Considering that the Coast Range protects the site from the sea, the potential for the site to be affected by a tsunami is nil.

A seiche is a free or standing wave oscillation that occurs in a confined body of water, such as a reservoir or lake. Earthquake-generated ground waves, which have a period that matches the natural period of the lake or reservoir, may cause the water to oscillate, which can cause damage to shoreline improvements. The MCGP indicates that earthquake-induced seiches are not considered a risk in Merced County.

5.4.2 Potential for Inundation Due to Dam Failure

According to the MCGP and the California Dam Breach Inundation Map Web Publisher, two major dams could cause substantial flooding in Merced County in the event of a failure: Castle Dam and Lake Yosemite Dam. Based on the inundation map, the project site does not lie within zones of inundation due to these failures. Therefore, flood specific mitigation measures such as preparing an emergency evacuation plan and route are not required.

5.4.3 Flood Insurance Rate Maps

According to the Federal Emergency Management Agency (FEMA), the project site lies within a Zone X flood designation (Map Number 06047C0200G, dated December 2, 2008) indicating the area is determined to be within the 0.2 percent annual chance flood; areas of 1 percent annual chance flood with average depths of less than 1 foot or drainage areas less than 1 square mile; and areas protected by levees from 1 percent annual chance flood. The civil engineer should plan site grades accordingly.

5.5 EXPANSIVE SOILS

An Expansion Index (EI) test was performed on a soil sample collected from the near surface soils of the site. The tests indicated the near surface soils have low (negligible) expansion characteristics as indicated by an EI of 0. Therefore, the potential for future differential movement of structures resulting from these soils shrinking or swelling is not likley.

5.6 HYDROCOMPACTION (SOIL COLLAPSE)

Our experience has found that some of the alluvial soils in the San Joaquin Valley are subject to hydrocompaction. Hydrocompactive soil has a relatively loose skeletal structure, which is weakly

cemented by soluble salts or a slight clay mineral content. Moisture increase breaks down the inter-particle cementation causing a collapse of the skeletal structure. The significant loss in soil volume can result in settlement of overlying structures. The geotechnical exploration and laboratory testing identified that hydrocompactive characteristics were minimal. Based on the laboratory testing, post saturation of soil samples obtained from the site indicated negligible collapse potential upon inundation. Therefore, mitigation due to hydrocomapction of foundation soils is not warranted.

5.7 CORROSIVE SOILS

The corrosion characteristics of the near surface foundation soils and any necessary mitigation measures are discussed in Section 7.6, “Corrosion Potential”.

5.8 REGIONAL SUBSIDENCE

Land subsidence occurs when a large portion of land is displaced vertically, usually due to the withdrawal of groundwater, oil, or natural gas. The MCGP does not identify subsidence within the proposed project area; however, MCGP acknowledges subsidence within the county area. Due to the significant depth to groundwater withdraw in the San Joaquin Valley, the occurrence of subsidence is typically regional and unlikely to affect isolated locations, as such, the potential for damaging differential settlement of the proposed building due to subsidence is low.

6 EARTHWORK

6.1 GENERAL

Based on the laboratory data, field exploration, and geotechnical analyses, it is feasible to construct the proposed Phase 3 modular building additions as currently envisioned. The use of spread and continuous reinforced concrete footings bearing on engineered fill are considered appropriate for structure support provided that the recommendations presented in this report are incorporated into the project design and construction.

Site grading recommendations are presented in subsequent sections of this report. All references to relative compaction, maximum density, and optimum moisture are based on ASTM Test Method D1557. All earthwork should extend a minimum of 5 feet beyond the perimeter of proposed improvements.

6.2 SITE PREPARATION

6.2.1 Demolition and Removal of Existing Structures

Existing structures and foundation systems should be removed within the proposed building and improvement areas during site preparation. If any remaining foundation systems, pavements, underground utilities, and/or other unsuitable structures exist from the previous improvements, they should be entirely removed from the proposed building pad areas.

6.2.2 Stripping

All surface vegetation and any miscellaneous surface obstructions should be removed from the project area, prior to any site grading. It is anticipated that stripping of vegetation and grass landscape will involve the upper 1 to 3 inches. Surface strippings should not be incorporated into fill unless they can be sufficiently blended to result in an organic content less than 3 percent by weight (ASTM D2974). Stripped topsoil, with an organic content between 3 and 12 percent by weight, may be stockpiled and used as non-structural fill (i.e. on landscape areas). If used in landscape areas, soil with an organic content between 3 and 12 percent should be placed within 2 feet of finished grade, and at least 5 feet outside of building perimeters. Soil with an organic content greater than 12 percent by weight should be excluded from fill.

6.2.3 Disturbed Soil, Undocumented Fill and Subsurface Obstructions

Initial site grading should include a reasonable search to locate disturbed soil, undocumented fill soils, debris, abandoned underground structures, and/or existing utilities that may exist within the area of construction. All underground utilities should be rerouted beyond the perimeter of the proposed improvements and all previous trench backfill and any loose soils generated by the utility removal should be removed to expose undisturbed native soil. If any areas or pockets of soft or loose soils or void spaces made by burrowing animals, undocumented fill, or other disturbed soil are encountered, they should be excavated to expose approved undisturbed native soil. Excavations for removal of the above items should be dish-shaped and backfilled with engineered fill (see Section 6.3).

6.2.4 Over-Excavation

After performing the removals described in Sections 6.2.1 through 6.2.3, the project site should be over-excavated a minimum depth of 24 inches below ground surface or 12 inches below bottom of footings, whichever is deeper, to mitigate loose or disturbed soils from the project area. The bottom of the excavation should be processed in accordance with Section 6.2.5 and the scarified soil should be recompacted according to Section 6.3.2. The lateral limits of the over-excavation should extend at least 5 feet beyond the perimeter of the proposed improvements.

6.2.5 Scarification and Compaction

After stripping the site and performing the over-excavation and any required removals, all areas to receive fill or to support structures, or concrete flatwork should be scarified at least 8 inches below exposed subgrade elevation. The subgrade soil should be uniformly moisture conditioned to at least optimum moisture, proof rolled to detect soft or pliant areas, and compacted to the requirements for engineered fill. Soft or pliant areas should be mitigated in accordance with Sections 6.2.3.

6.2.6 Construction Considerations

Should site grading be performed during or subsequent to wet weather, near-surface site soils may be significantly above optimum moisture content. These conditions could hamper equipment maneuverability and efforts to compact site soils to the recommended compaction criteria. Disking to aerate, chemical treatment, replacement with drier material, stabilization with

a geotextile fabric or grid, or other methods may be required to mitigate the effects of excessive soil moisture and facilitate earthwork operations. Any consideration of chemical treatment (e.g. lime) to facilitate construction would require additional soil chemistry evaluation and could affect landscape areas and some construction materials.

6.3 ENGINEERED FILL

6.3.1 Materials

All engineered fill soils should be nearly free of organic or other deleterious debris and less than 3 inches in maximum dimension. The on-site soil exclusive of debris may be used as engineered fill, provided it contains less than 3 percent organics by weight (ASTM D2874).

Recommended requirements for any imported soil to be used as engineered fill, as well as applicable test procedures to verify material suitability, are provided on Table 6.3-1.

TABLE 6.3-1
IMPORT FILL CRITERIA

Gradation (ASTM C136)			
Sieve Size	**Percent Passing**		
76 mm (3-inch)	100		
19 mm (¾-inch)	80 – 100		
No. 4	60 – 100		
No. 200	20 – 50		
Expansion Index (ASTM D4829)	**Plasticity (ASTM D4318)**		
	Liquid Limit	**Plasticity Index**	
< 20	< 25	< 9	
Organic Content (ASTM D 2974)			
< 3% by dry weight			
Corrosivity			
pH	**Minimum Resistivity (ohm-cm)**	**Soluble Sulfate (ppm)**	**Soluble Chloride (ppm)**
6 to 8	> 2,000	< 2,000	< 500

The import criteria for corrosion are typical threshold limits for non-corrosive soil. All imported fill materials to be used for engineered fill should be sampled and tested by a representative of the project Geotechnical Engineer prior to being transported to the site. In addition, import fill should meet the requirements of the Department of Toxic Substances Control (DTSC), Information Advisory for Clean Imported Fill Material. The purpose of testing import soils is to ensure that "clean" fill soils are imported to otherwise "clean" sites. The testing does not require notification of the DTSC, rather the testing should be performed as part of the routine due diligence of constructing on state property and the results filed with the school district.

6.3.2 Compaction Criteria

Soils used for engineered fill should be uniformly moisture conditioned to at least optimum moisture, placed in horizontal lifts less than 8 inches in loose thickness, and compacted to at least 90 percent relative compaction. Disking and/or blending may be required to uniformly moisture-condition soils used for engineered fill.

6.4 TEMPORARY EXCAVATIONS

6.4.1 General

All excavations must comply with applicable local, State, and Federal safety regulations including the current Occupational Safety and Health Administration (OSHA) Excavation and Trench Safety Standards. Construction site safety is generally the responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. The information provided is a service to the client. Under no circumstances should the information provided be interpreted to mean that **TECHNICON** is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

6.4.2 Excavations and Slopes

The Contractor should be aware that slope height, slope inclination, or excavation depths (including utility trench excavations) should in no case exceed those specified in local, State, and/or Federal Safety regulations (e.g., OSHA health and Safety Standards for Excavations, 29 CFR Part 1926, or successor regulations). All excavations should be constructed and

maintained in conformance with current OSHA requirements (29 CFR Part 1926) for a Type C (Silty Sand) soil.

6.4.3 Construction Considerations

Heavy construction equipment, building materials, excavated soil, and vehicular traffic should be kept sufficiently away from the top of any excavation to prevent any unanticipated surcharging. If it is necessary to encroach upon the top of an excavation, **TECHNICON** can provide comments on slope gradients or loads on shoring to address surcharging, if provided with the geometry. Shoring, bracing, or underpinning required for the project (if any), should be designed by a professional engineer registered in the State of California.

During wet weather, earthen berms or other methods should be used to prevent run-off water from entering all excavations. All run-off should be collected and disposed of outside construction limits.

6.5 TRENCH BACKFILL

6.5.1 Materials

Pipe zone backfill (i.e., material beneath and in the immediate vicinity of the pipe), should consist of soil compatible with design requirements for the specific types of pipes. It is recommended the project designer or pipe supplier develop the material specifications based on planned pipe types, bedding conditions, and other factors beyond the scope of this investigation. Randomly excavated on-site soil will likely be Class III material per ASTM D2321.

Trench zone backfill (i.e., material placed between the pipe zone backfill and finished subgrade) may consist of native soil which meets the requirements for engineered fill. If granular import material is used for pipe or trench zone backfill, it should have a piping ratio compatible with the adjacent soil, or a geofabric separator should be utilized.

6.5.2 Compaction Criteria

All trench backfill should be placed and compacted in accordance with recommendations provided for engineered fill. Mechanical compaction is recommended; ponding or jetting should not be used.

7 DESIGN RECOMMENDATION

7.1 GENERAL

The proposed structures may be supported by conventional shallow spread footings supported on properly engineered fill. The following recommendations are based on the assumption that the recommendations in Section 6, “Earthwork”, have been implemented. Recommendations regarding the geotechnical aspects of building design are presented in subsequent sections.

7.2 SPREAD FOOTINGS

7.2.1 Vertical Bearing Pressures and Settlements – Strip and Spread Foundations

Generally, two geotechnical issues determine the design bearing pressure for conventional spread footing foundations: strength of the foundation soil, and tolerable settlement. For lightly loaded structures, design bearing may be determined by constructability considerations or code-required minimum dimensions.

Table 7.2-1 presents the allowable available bearing capacity for static loading which includes dead load plus live load (D.L. + L.L.) and total combined loading (D.L. + L.L. + transient loading, such as wind or seismic), and unfactored nominal bearing.

TABLE 7.2-1
BEARING CAPACITY

	Bearing Capacity (psf)
Static Loading	610 B + 1,235 D
Total Combined Loading	920 B + 1,855 D
Unfactored Ultimate Bearing	1,835 B + 3,705 D

Note: 1) B is the footing width (ft), D is the footing depth (ft)

To simplify design, an allowable bearing pressure of 2,000 psf (static loading, D.L. + L.L.) could be considered. The bearing pressure could be increased 50 percent for evaluating transient loads, such as, wind or seismic.

The foundation soil is anticipated to have a low expansive potential. Therefore, foundation embedment and reinforcement should be consistent with structural or architectural considerations and the 2022 CBC.

Analysis, based on methods by Schmertmann, determined the following estimated static settlement based on a range of assumed design bearing and estimated structural loads. Settlement is expected to occur rapidly with load application. The estimated settlements presented in Table 7.2-2 are based on the assumption that the sustained load of footings is equal to 80 percent of the total load.

TABLE 7.2-2
ESTIMATED SETTLEMENT

Footing Type	Loading (DL + LL)	Design Bearing (psf)	Estimated Settlement (inch)
Strip	3 kips/ft	2,560	0.50
Square	30 kips	3,615	0.50

If deemed necessary by the structural engineer, **TECHNICON** can provide the estimated settlement for other loading conditions.

7.2.2 Lateral Resistance

Lateral loads applied to foundations can be resisted by a combination of passive lateral bearing and base friction. Table 7.2-3 presents the allowable and ultimate passive pressures and frictional coefficients.

TABLE 7.2-3
PASSIVE PRESSURES AND FRICTIONAL COEFFICIENTS

	Allowable		Ultimate
	Static	Total Combined	
Frictional Coefficient	0.43	0.52	0.65
Passive Pressure (psf/ft)	345	460	690
Lateral Translation Needed to Develop Passive Pressure	0.004 D	0.007 D	0.018 D

Note: 1) D is the footing depth (ft)

If the deflection resulting from the strain necessary to develop the passive pressure is beyond structural tolerance, additional passive pressure values could be provided based on tolerable deflection. The passive pressure and frictional resistance can be used in combination. The

allowable values already incorporate a factor of safety and, as such, would be compared directly to the driving loads. If analytical approaches require the input of a safety factor, the ultimate values would be used.

7.2.3 Design and Construction Considerations

Prior to placing steel or concrete, footing excavations should be cleaned of all debris, loose soft soil, and water. All footing excavations should be observed by a representative of the project Geotechnical Engineer immediately prior to placing steel or concrete. The purpose of these observations is to verify that the bearing soils encountered in the foundation excavations are similar to those assumed in the analysis and to verify these recommendations are implemented.

7.3 EARTH RETAINING STRUCTURES

If project improvements will include retained earth systems, the lateral earth pressure against retaining structures will be dependent upon the ability of the wall to deflect. Presented in Table 7.3-1 are the active, at-rest, and braced lateral earth pressures for on-site soil. The active pressure is applicable to walls able to rotate 0.0005 radians at the top or bottom. The at-rest soil pressure is applicable to retaining structures that are fully fixed against both rotation and translation. Walls restrained from translation at the top and bottom, but able to deflect 0.0005 radian between restrained points should be designed for the braced lateral pressure.

TABLE 7.3-1
LATERAL EARTH PRESSURES

	Lateral Earth Pressures
Active Pressure (psf/ft of depth)	37
At-Rest Pressure (psf/ft of depth)	58
Braced Pressure (psf)	24 H

Note: H in the expression represents the retained height in feet (measured from finished grade to bottom of footing).

The recommended values incorporate saturated soil conditions but not the lateral pressure due to hydrostatic forces. Wall backfill should be adequately drained.

Retaining wall foundation design can utilize the passive pressures and frictional resistance given in Table 7.2-3 and the bearing capacities given in Table 7.2-1. When utilizing the bearing capacities of Table 7.2-1, the static loading value represents the average bearing for the footing

and the total combined loading value presents the allowable maximum toe pressure.

7.4 SLABS-ON-GRADE

7.4.1 Subgrade Preparation

Slabs-on-grade should be supported on recompacted soils or engineered fill placed as described in Section 6.3 of this report. Subgrade soils within 12 inches of pad grade should have a moisture content of at least optimum immediately prior to placing the slab concrete, or placing the vapor retarding membrane.

7.4.2 Capillary and Moisture/Vapor Break

Considering the soil type and regional groundwater depth, a capillary break (i.e. clean sand or gravel layer) is not considered necessary.

In areas to receive moisture-sensitive floor coverings, it is recommended that the subgrade be covered by a 10 mil vapor retarding membrane meeting the specifications of ASTM E1745, (Class C with minimum puncture resistance of 475 grams). The subgrade surface should be smooth and care should be exercised to avoid tearing, ripping, or otherwise puncturing the vapor retarding membrane. If the vapor retarding membrane becomes torn or disturbed, it should be removed and replaced or properly patched. Considering the soil type and regional groundwater depth, a capillary break (i.e., clean sand or gravel layer) is considered unnecessary.

The vapor retarding membrane could be covered with approximately 1 to 2 inches of saturated surface dry (SSD) sand to protect it during construction. Concrete should not be placed if sand overlying the vapor barrier has been allowed to attain a moisture content greater than about 5 percent (due to precipitation or excessive moistening). In addition, penetrations through the concrete slab shall be sealed or protected to prevent inadvertently introducing excess water into the sand cushion layer due to curing water, wash-off water, rainfall, etc. Excessive water beneath interior floor slabs could result in future significant vapor transmission through the slab, adversely affecting moisture-sensitive floor coverings and could inhibit proper concrete curing.

According to American Concrete Institute (ACI) 302.2R-06, concrete could be placed directly on the vapor retarding membrane to minimize the potential for developing a reservoir of moisture in the sand layer, which could lead to future moisture entrapment and potential moisture and flooring problems. If concrete is placed directly on the membrane, care should be taken to not

damage the membrane and special concrete curing methods implemented to minimize potential slab curing problems. If the protective sand layer is not used, the building designer should be in agreement. Many slab designers feel the sand cushion is important to proper concrete curing as well as minimizing slab curling issues.

Although slab support currently the industry standard, this system might not be completely effective in preventing floor slab moisture vapor transmission problems. This system will not necessarily assure that floor slab moisture transmission rates will meet floor-covering manufacturer standards and that indoor humidity levels will not inhibit mold growth. A qualified specialist(s) with knowledge of slab moisture protection systems, flooring design and other potential components that may be influenced by moisture, should address these post-construction conditions separately. The purpose of a geotechnical investigation is to address subgrade conditions only, and consequently, it does not evaluate future potential conditions.

7.4.3 Conventional Slab Design

There are no geotechnical considerations (e.g., expansive soil), which would require special design of slabs. Therefore, the thickness and reinforcement of slabs-on-grade should be determined by structural considerations and should be designed by the project structural engineer or building designer. A modulus of subgrade reaction, K_p (B_p = 1 foot), of 300 pci may be used for elastic analysis of slabs on properly compacted subgrade. Slab concrete should have good density, a low water/cement ratio, and proper curing to promote a low porosity and reduce moisture vapor transmission.

7.5 PIER FOUNDATIONS

Pier foundations may be desirable for support of shade structures, lighting, etc. Presented in Table 7.5-1 are expressions for the allowable and ultimate friction resistance vales for vertical compression loads on pier foundations.

TABLE 7.5-1
ALLOWABLE AXIAL CAPACITY

	Frictional Resistance for Vertical Loads in Compression (lbs)
Static Loading	60 DL^2
Total Combined Loading	75 DL^2
Unfactored Ultimate Capacity	115 DL^2

Note: 1) D is pier diameter in feet and L is embedment length in feet.
2) The allowable uplift resistance would be 70 percent of the compressional resistance.

The allowable passive pressure to resist lateral loads on isolated piers may be taken as 195 psf per foot of depth of embedment. The value may be increased by one-third for the total combined loads, including wind and seismic. The passive pressure values already consider arching and, as such, should not be increased further. The passive pressure only considers soil strength. Tolerable pier deflection may govern the design lateral resistance. If provided with pier geometry, lateral load, and loading eccentricity, **TECHNICON** can provide the estimated pier head deflection.

7.6 CORROSION POTENTIAL

One (1) soil sample from the near surface of the site were tested for pH, minimum electrical resistivity, and soluble sulfate and chloride.

The pH of the soil tested was 7.17 and the minimum electrical resistivity was 4,899 ohm-cm. These values are generally representative of an environment that could be mildly corrosive to buried unprotected metals. Utilizing methods provided in Caltrans California Test 643, “Method for Estimating the Service Life of Steel Culverts”, an 18-gauge steel zinc-coated culvert is estimated to have a maintenance-free service life (years to perforation) exceeding 30 years. Therefore, if project improvements will involve metal that comes into contact with the on-site soil, the design should consider this potential soil corrosiveness described.

Test results suggest that low levels of soluble sulfates (6 ppm) and low levels of soluble chlorides (10 ppm) are present in on-site soils. Normal cement (Type II) and normal reinforcement cover should be adequate for foundation concrete that comes in contact with the foundation soils.

Corrosion is dependent upon a complex variety of conditions, which are beyond the geotechnical practice. Consequently, a qualified corrosion engineer should be consulted if the owner desires more specific recommendations.

7.7 SITE DRAINAGE

Providing and maintaining adequate site drainage to prevent entrapment and ponding of surface water and excessive moisture migration into the subgrade soil is very important. Poor perimeter or surface drainage could cause reduced subgrade support. The site should incorporate the basis for good drainage. This includes:

- Sufficient pad height to allow for proper drainage; and
- Defined drainage gradients away from the structure to points of conveyance, such as drainage swales and/or area drains and discharge pipe.

The maintenance personnel must maintain the established drainage by not blocking or obstructing gradients away from structures without providing some alternative drainage means (e.g., area drains and subsurface pipes). If planter or landscape areas are established near the structures, it is important to prevent surface run-off from entering the planter and care must be taken not to over irrigate and to maintain a leak-free sprinkler piping system. Consideration should be given to use of low volume emitter irrigation systems for planters. Well-maintained low-volume emitter irrigation (drip system) is best suited for planters adjacent to structures. Watering practices must strive to use only sufficient water to sustain and promote plant growth.

8 ADDITIONAL SERVICES

8.1 DESIGN REVIEW AND CONSULTATION

It is recommended that **TECHNICON** be retained to review those portions of the contract drawings and specifications that pertain to earthwork and foundations prior to finalization to determine whether they are consistent with our recommendations.

8.2 CONSTRUCTION OBSERVATION AND TESTING

It is recommended that a representative of **TECHNICON** observe the excavation, earthwork, and foundation, phases of work to determine that the subsurface conditions are compatible with those used in the analysis and design. **TECHNICON** can conduct the necessary field testing and provide results on a timely basis so that action necessary to remedy indicated deficiencies can be taken in accordance with the plans and specifications. Upon completion of the work, a written summary of our observations, field testing, and conclusions regarding the conformance of the completed work to the intent of the plans and specifications will be provided. This additional service is not part of this current contractual agreement. **TECHNICON** will not be responsible for establishing or confirming building or foundations depths or locations unless retained to do so.

9 LIMITATIONS

The conclusions and recommendations presented in this report are based on the information provided regarding the proposed construction, and the results of our field and laboratory investigation, combined with interpolation of the subsurface conditions between boring locations. The nature and extent of the variations between borings may not become evident until construction. If variations or undesirable conditions are encountered during construction, our firm should be notified promptly so that these conditions can be reviewed and our recommendations reconsidered where necessary. The unexpected conditions frequently require additional expenditures for proper construction of the project. **TECHNICON Engineering Services, Inc.** will not assume any responsibility for errors or omissions if the final extent and depth of earthwork is not determined by our firm at the time of construction due to said variations or undesirable conditions encountered.

If the proposed construction is relocated or redesigned, or if there is a substantial lapse of time between the submission of our report and the start of work at the site, or if conditions have changed due to natural causes, or construction operations at or adjacent to the site, the conclusions and recommendations contained in this report should be considered invalid unless the changes are reviewed and our conclusions and recommendations modified or approved in writing. Such conditions may require additional field and laboratory investigations to determine if our conclusions and recommendations are applicable considering the changed conditions or time lapse.

It is the responsibility of the contractor to provide safe working conditions with respect to excavation slope stability. This report does not relieve the contractors of responsibility for temporary excavation construction, bracing and shoring in accordance with CAL OSHA requirements.

Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied. This report should not be construed as an environmental audit or study.

This report has been prepared for the sole use by Merced City School District and their designated consultants for the proposed Phase 3 Modular Building Addition at the Franklin Elementary School in Merced, California. Recommendations presented in this report should not be extrapolated to other areas or used for other projects without prior review. This report has been prepared with the intent that the firm of **TECHNICON** will be performing the construction testing and observation for the complete project. If, however, another firm or individual(s) should be retained or employed to use this geotechnical investigation report for the purpose of construction testing and observation, notice is hereby given that **TECHNICON** will not assume any responsibility for errors or omissions, if any, which may occur and which could have been avoided, corrected, or mitigated if **TECHNICON**, had performed the work. This notice also applies to the misuse or misinterpretation of the conclusions and recommendations outlined in this report. Furthermore, the other firm or individual(s) performing construction testing and observation should accept transfer of responsibility of the work, as required by the California Building Code, in writing to the project owner and **TECHNICON**. The firm accepting transfer of responsibility should perform additional investigation(s) as may be necessary to develop their own conclusions, evaluations, and recommendations for design and construction.

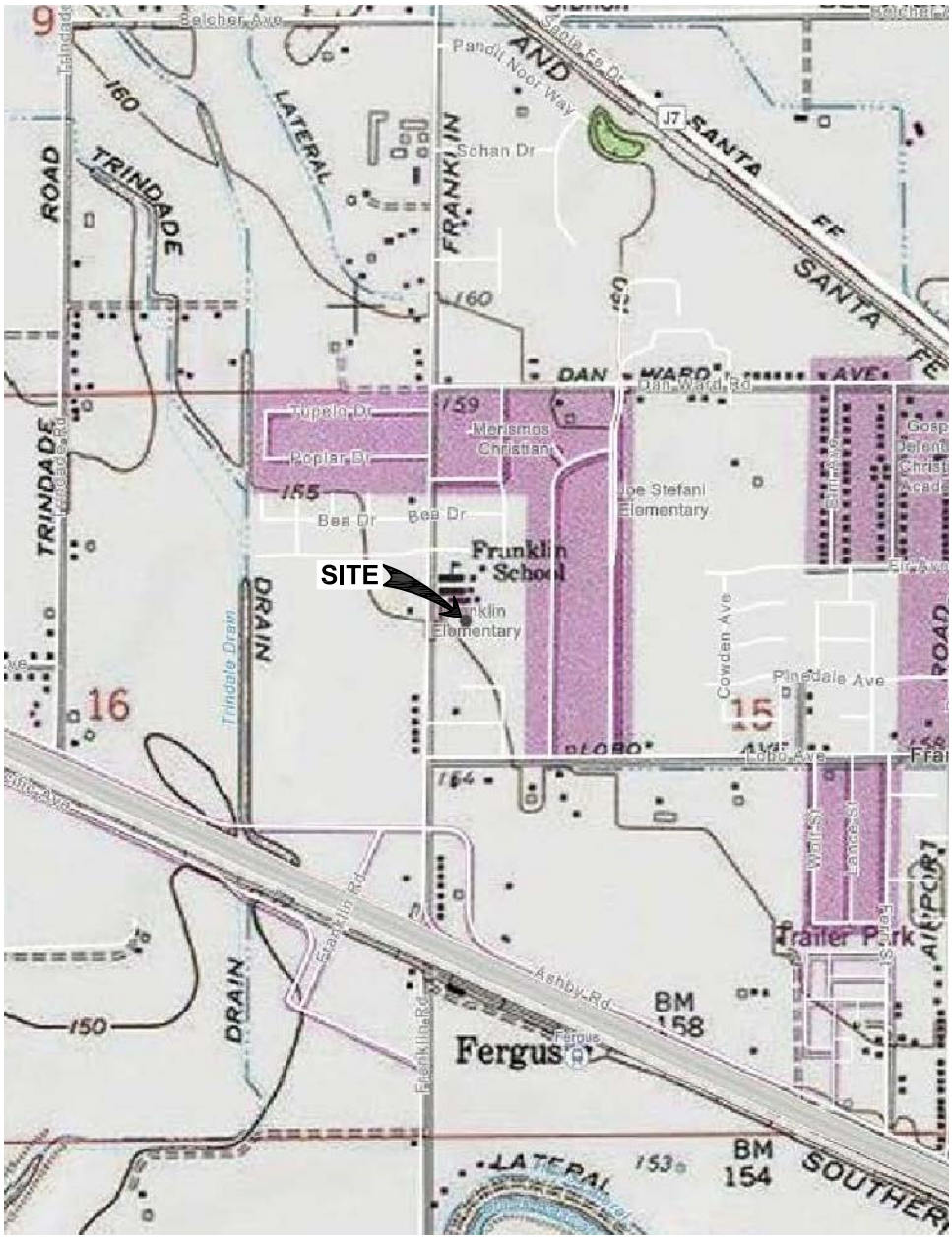
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FIGURES

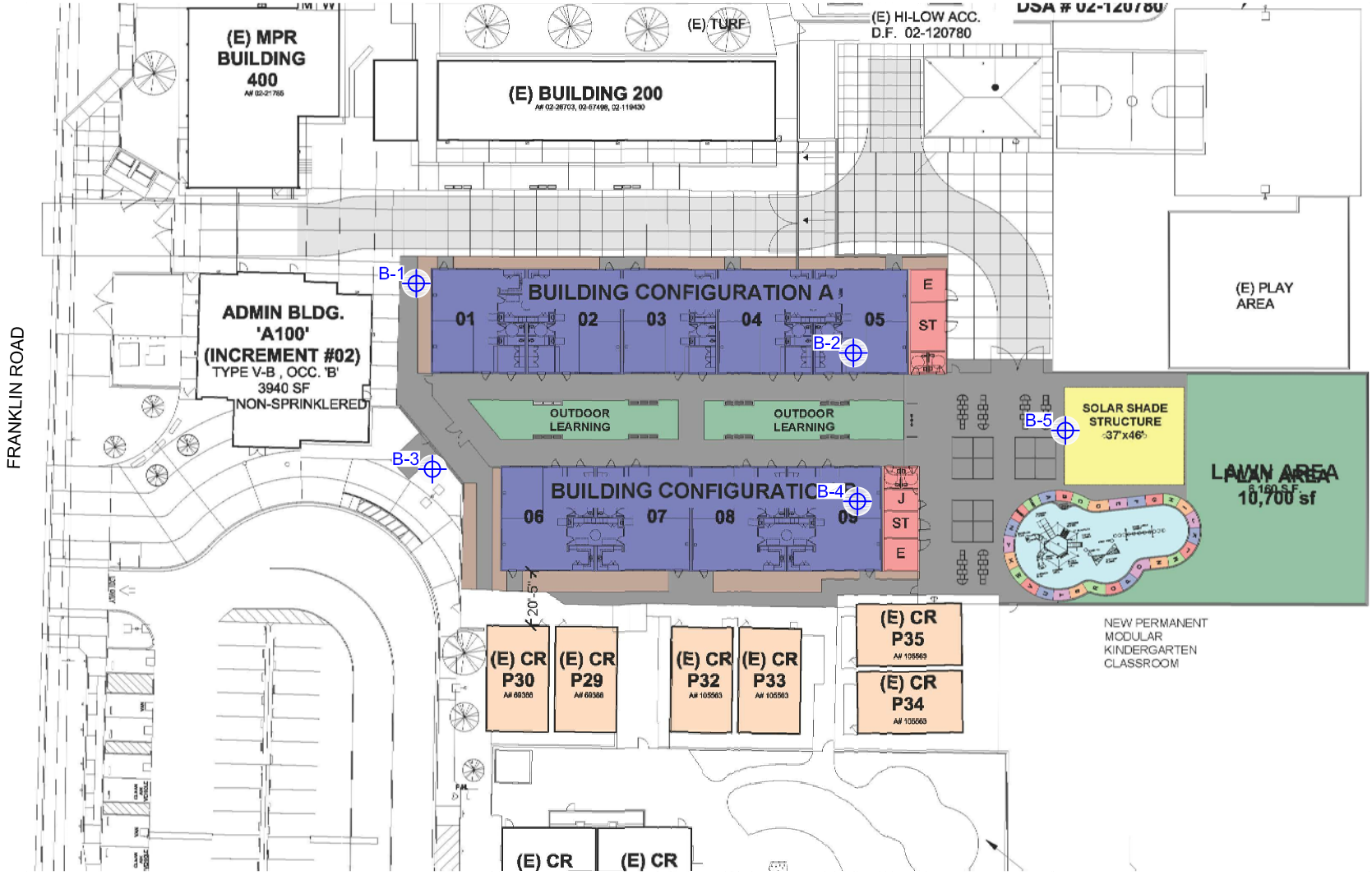
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LAT.: 37.3271°N, LONG.: 120.5400°W, 15-T7S-R13E, MDB&M

NORTH

TECHNICON ENGINEERING SERVICES, INC.	PROJECT: 240426	VICINITY MAP PROPOSED PH 3 MODULAR BUILDING ADDITION FRANKLIN ELEMENTARY SCHOOL 2736 FRANKLIN ROAD MERCED, CALIFORNIA	FIGURE 1
	SOURCE: USGS TOPOGRAPHIC MAPS		NTS



=SOIL BORING LOCATIONS

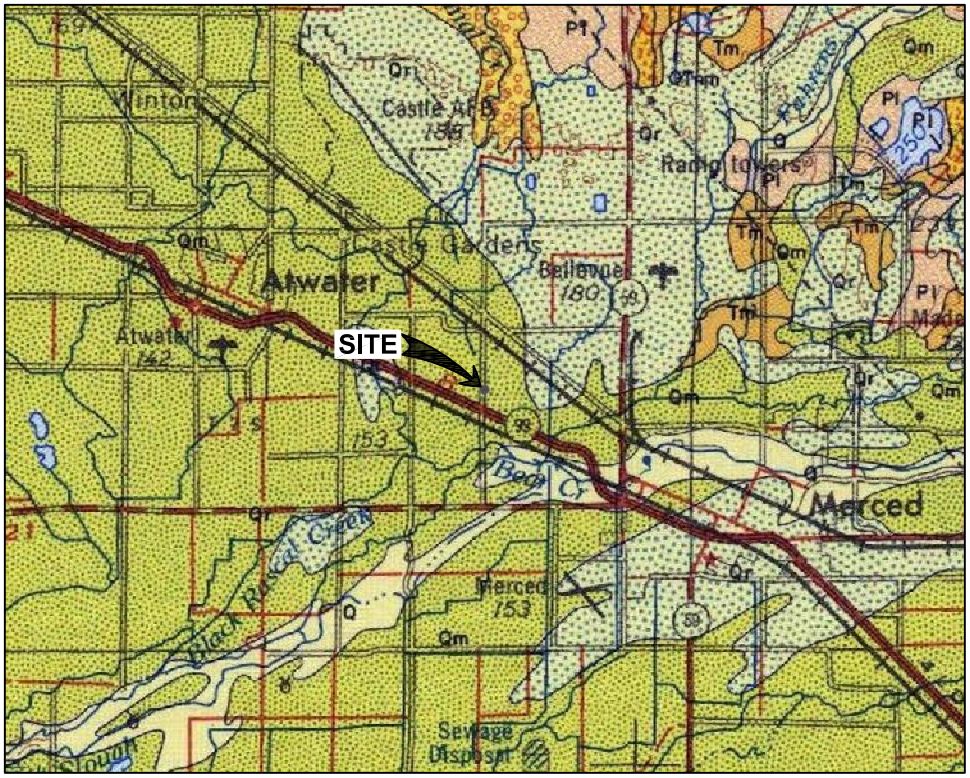
NORTH

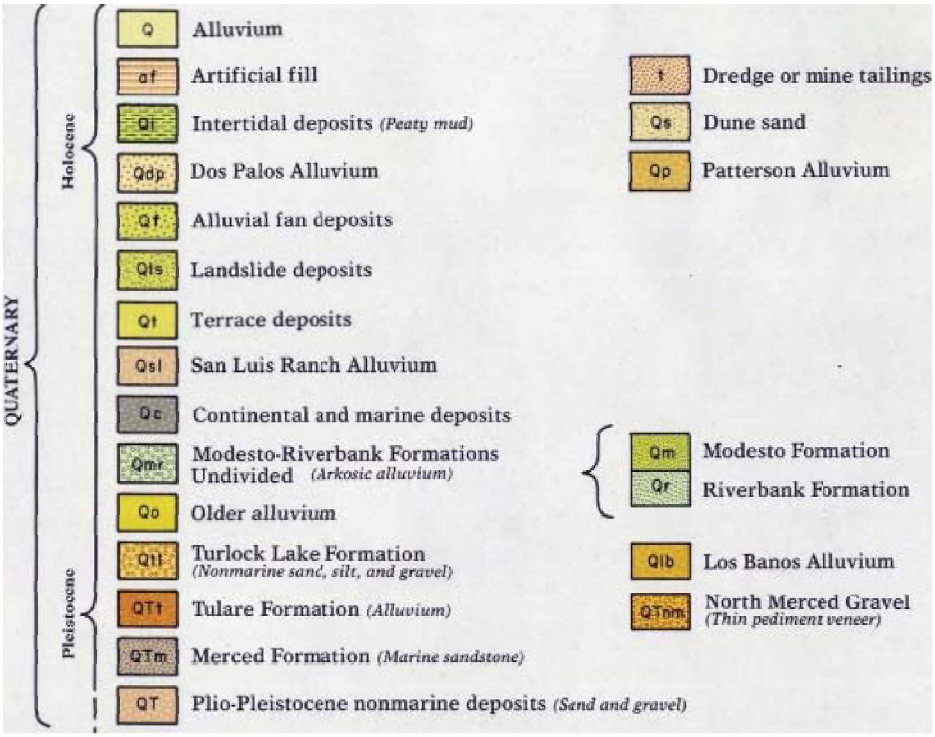
SCALE: 1"=60'

0' 30' 60'

TECHNICON
ENGINEERING SERVICES, INC.

PROJECT: 240426	DATE: 8/29/24	SITE MAP PROPOSED PH 3 MODULAR BUILDING ADDITION FRANKLIN ELEMENTARY SCHOOL 2736 FRANKLIN ROAD MERCED, CALIFORNIA	FIGURE 2
SOURCE: TETER	APPROVED BY: AA		

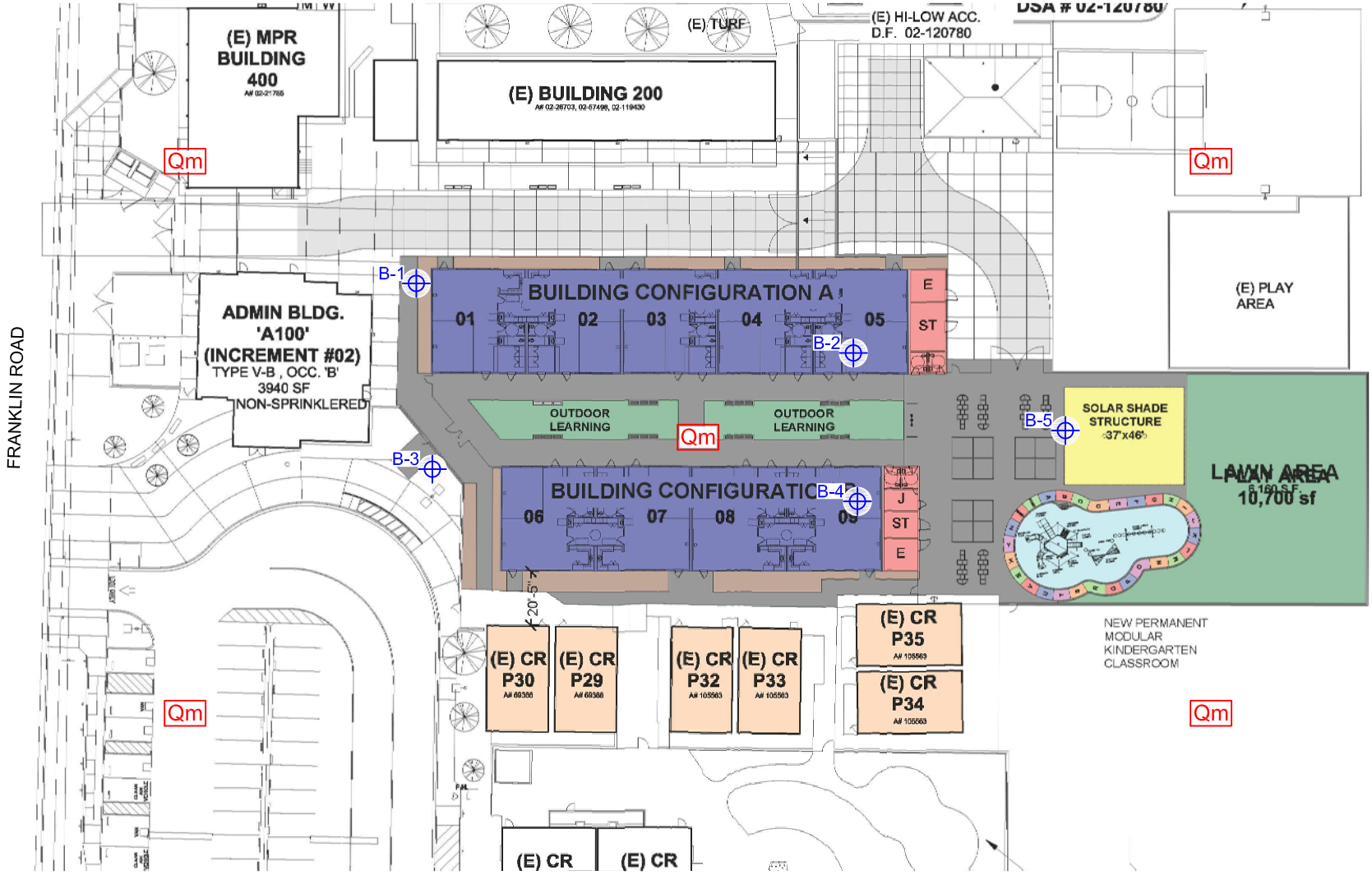




GEOLOGIC MAP OF THE SAN FRANCISCO - SAN JOSE QUADRANGLE, CALIFORNIA, SCALE 1:250,000 - 1991

NORTH

TECHNICON ENGINEERING SERVICES, INC.	PROJECT: 240426 SOURCE: DIVISION OF MINES AND GEOLOGY	REGIONAL GEOLOGIC MAP PROPOSED PH 3 MODULAR BUILDING ADDITION FRANKLIN ELEMENTARY SCHOOL 2736 FRANKLIN ROAD MERCED, CALIFORNIA	FIGURE 3 NTS



Qm =MODESTO FORMATION

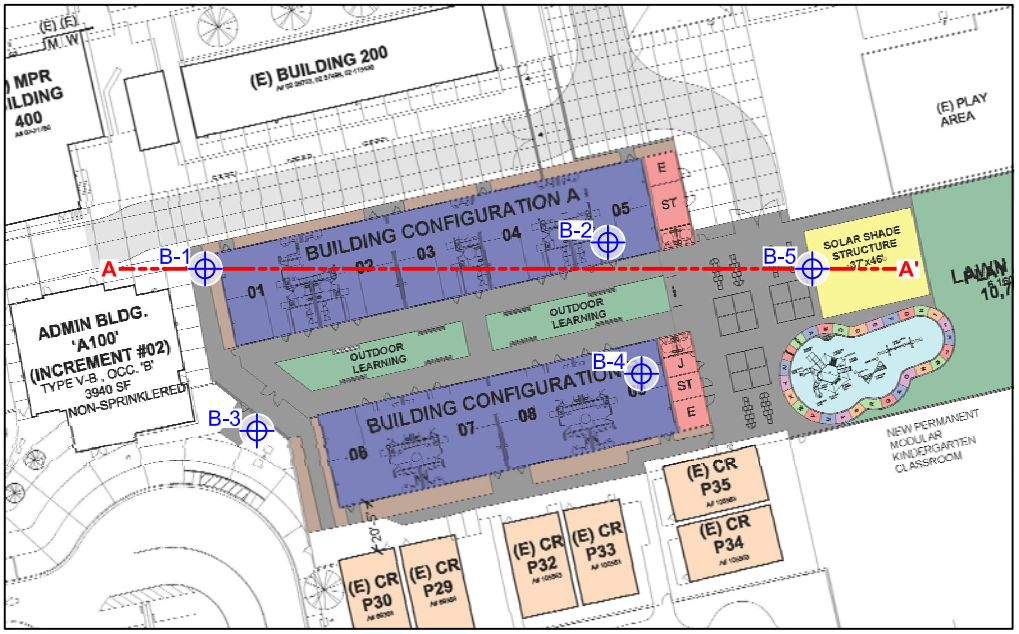
=SOIL BORING LOCATIONS

NORTH

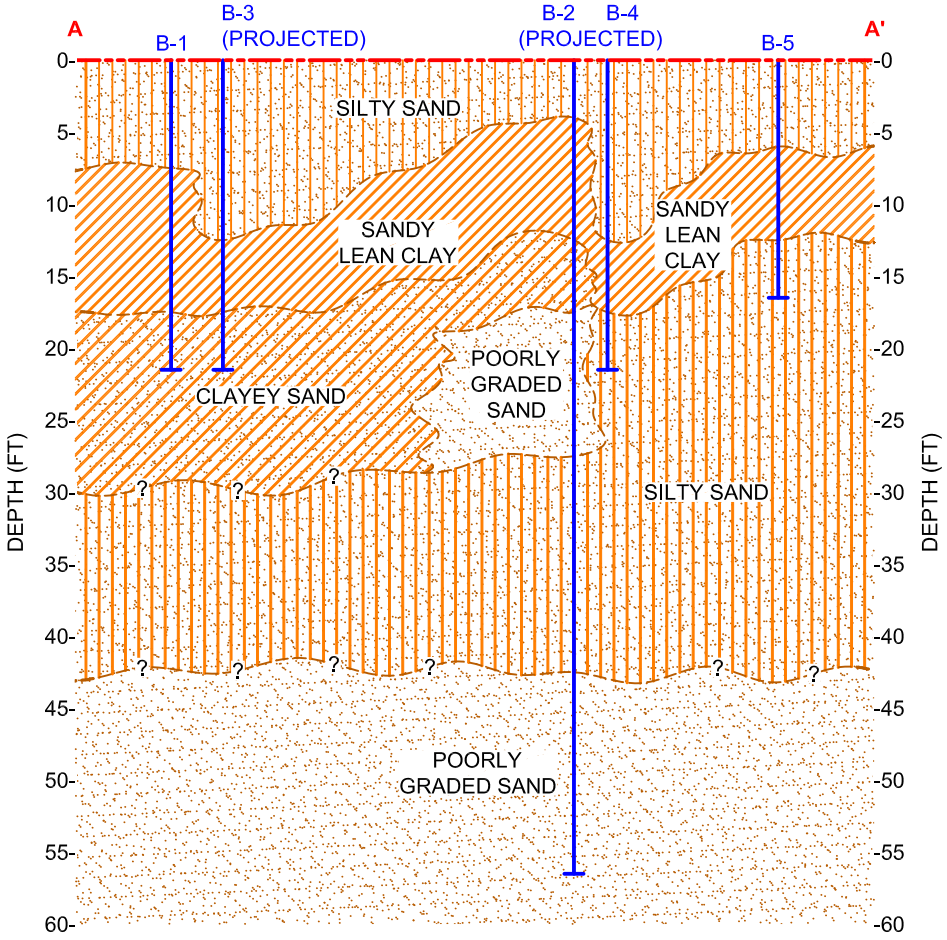
SCALE: 1"=60'

0' 30' 60'

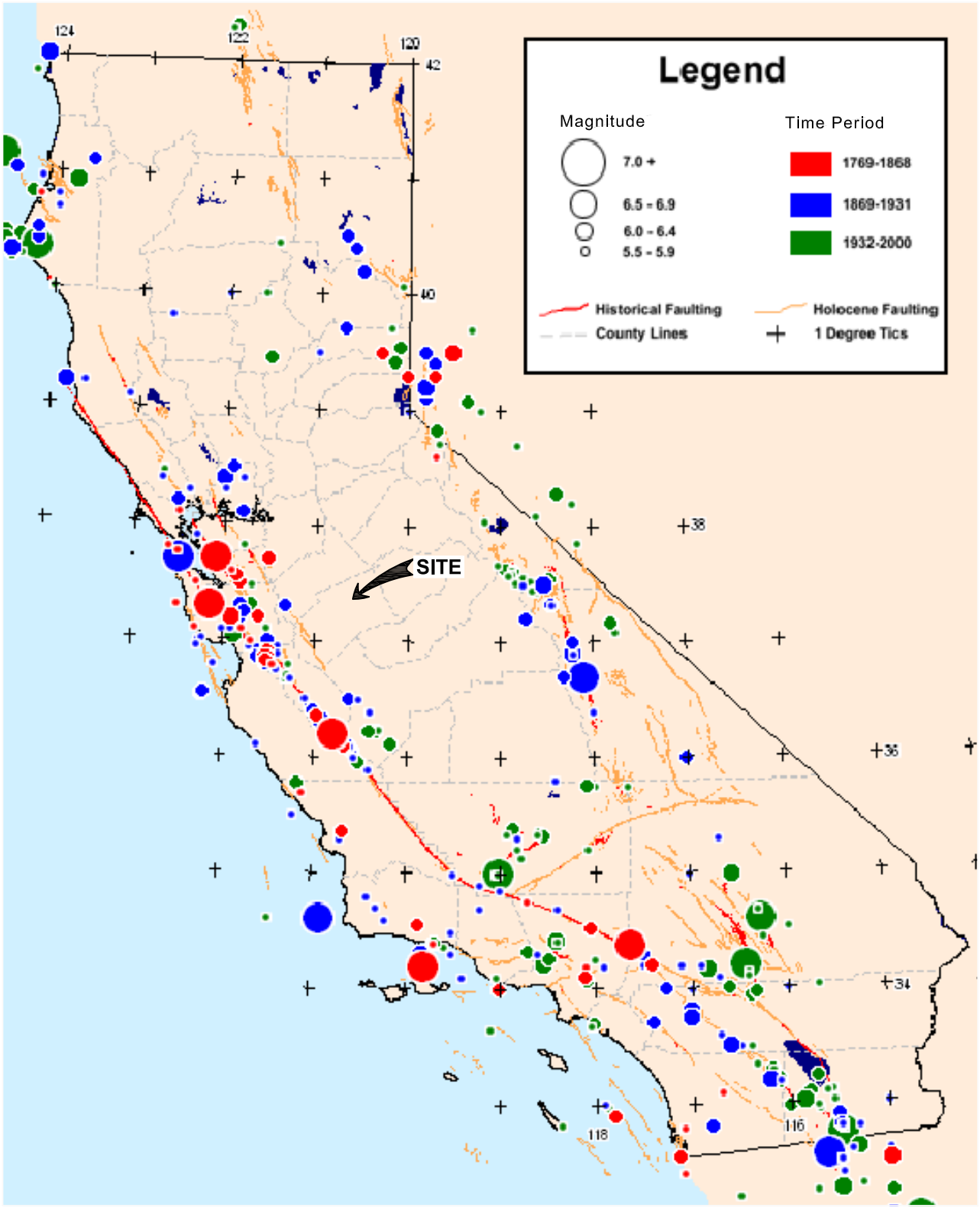
TECHNICON ENGINEERING SERVICES, INC.	PROJECT: 240426	DATE: 8/29/24	GEOLOGIC MAP OF SITE PROPOSED PH 3 MODULAR BUILDING ADDITION FRANKLIN ELEMENTARY SCHOOL 2736 FRANKLIN ROAD MERCED, CALIFORNIA
	SOURCE: TETER	APPROVED BY: AA	FIGURE 4



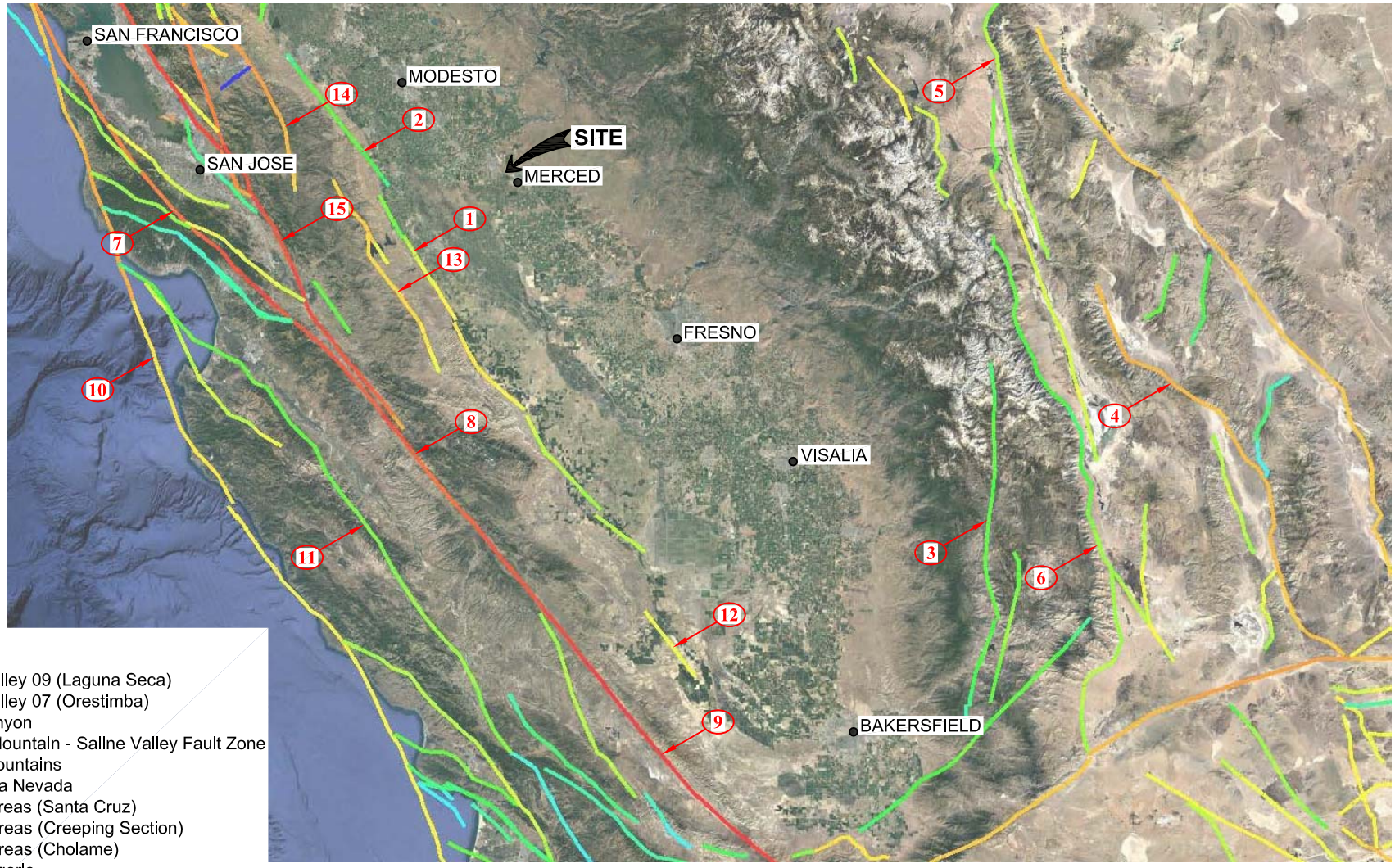
NORTH
SCALE: 1"=80'



TECHNICON ENGINEERING SERVICES, INC.	PROJECT: 240426	CROSS SECTION A-A' PROPOSED PH 3 MODULAR BUILDING ADDITION FRANKLIN ELEMENTARY SCHOOL 2736 FRANKLIN ROAD MERCED, CALIFORNIA	FIGURE 5
	CAD BY: MH		



TECHNICON ENGINEERING SERVICES, INC.	PROJECT: 240426	EPICENTER MAP PROPOSED PH 3 MODULAR BUILDING ADDITION FRANKLIN ELEMENTARY SCHOOL 2736 FRANKLIN ROAD MERCED, CALIFORNIA	FIGURE 6
	SOURCE: CGS		NTS



FAULTS

1. Great Valley 09 (Laguna Seca)
2. Great Valley 07 (Orestimba)
3. Kern Canyon
4. Hunter Mountain - Saline Valley Fault Zone
5. White Mountains
6. SO Sierra Nevada
7. San Andreas (Santa Cruz)
8. San Andreas (Creeping Section)
9. San Andreas (Cholame)
10. San Gregorio
11. Reliz
12. Lost Hills
13. Ortigalita
14. Greenville
15. Calaveras

NORTH

TECHNICON
ENGINEERING SERVICES, INC.

PROJECT: 240426	DATE: 8/12/24	REGIONAL FAULT ACTIVITY MAP PROPOSED PH 3 MODULAR BUILDING ADDITION FRANKLIN ELEMENTARY SCHOOL 2736 FRANKLIN ROAD MERCED, CALIFORNIA	FIGURE 7 NTS
SOURCE: WGCEP	APPROVED BY: CO		

BORING LOGS AND LOG KEY

APPENDIX A

TECHNICON Engineering Services, Inc.
4539 N. Brawley Avenue #108
Fresno, California 93722
Telephone: 559.276.9311

KEY TO SYMBOLS

PROJECT NAME Proposed Phase 3 Modular Building Addition
DATE OF EXPLORATION 7/26/2024
PROJECT LOCATION Merced, California
PROJECT NUMBER 240426

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)

		FILL
	SW	WELL GRADED SAND
	SP	POORLY GRADED SAND
	SM	SILTY SAND
	SC	CLAYEY SAND
	PT	PEAT
	OL	LOW PLASTICITY ORGANIC SILT
	OH	HIGH PLASTICITY ORGANIC SILT
	ML	LOW PLASTICITY SILT
	MH	HIGH PLASTICITY SILT
	GW	WELL GRADED GRAVEL
	GP	POORLY GRADED GRAVEL
	GM	SILTY GRAVEL
	GC	CLAYEY GRAVEL
	CL	LOW PLASTICITY CLAY
	CH	HIGH PLASTICITY CLAY

SAMPLER SYMBOLS

- STANDARD PENETRATION TEST
- CALIFORNIA SAMPLER
- MODIFIED CALIFORNIA SAMPLER
- SHELBY TUBE SAMPLER
- ROCK CORE BARREL
- BULK SAMPLE

- Water Level at Time of Drilling
- Water Level at End of Drilling
- Water Level After 24 Hours
- Assumed stratum line
- Observed stratum line

Note 1: The degree of saturation shown on the boring logs is based on an assumed specific gravity of 2.65. The actual degree of saturation may vary.

Note 2: The stratum lines shown on the logs represent the approximate boundary between soil types; the actual in-situ transition may be gradual.

ABBREVIATIONS

LL	- LIQUID LIMIT (%)
PI	- PLASTIC INDEX (%)
W	- MOISTURE CONTENT (%)
DD	- DRY DENSITY (PCF)
S	- DEGREE OF SATURATION (%)
NP	- NON PLASTIC
200	- PERCENT PASSING NO. 200 SIEVE
PP	- POCKET PENETROMETER (TSF)
ND	- NOT DETECTED
TV	-TORVANE
PID	-PHOTOIONIZATION DETECTOR
UC	-UNCONFINED COMPRESSION
ppm	-PARTS PER MILLION
TPH-d	-TOTAL PETROLEUM HYDROCARBON AS DIESEL
TPH-mo	-TOTAL PETROLEUM HYDROCARBON AS MOTOR OIL

KEY TO SYMBOLS 2 - TECHNICON.GDT - 8/29/24 08:34 - Z:\TESDATA\PROJECTS\PROJECTS\240400- 240499\240426 PHASE 3 MODULAR BUILDING ADDITION\240426 - GINT.GPJ

TECHNICON Engineering Services, Inc.
4539 N. Brawley Avenue #108
Fresno, California 93722
Telephone: 559.276.9311

BORING B-1

PROJECT NAME Proposed Phase 3 Modular Building Addition
PROJECT NUMBER 240426
PROJECT LOCATION Merced, California
SURFACE DESCRIPTION Bare soil & weeds
DATE STARTED 7/26/24 **COMPLETED** 7/26/24
GROUND ELEVATION 0 ft
DRILLING CONTRACTOR TECHNICON Engineering Services, Inc.
GROUND WATER LEVEL No groundwater encountered.
DRILL RIG TYPE SIMCO 2800
BORING DEPTH 21.5 ft
DRILLING METHOD 4-inch Solid Flight Auger
LOGGED BY C. Odneal **CHECKED BY** A. AhTye

DEPTH (ft)	SAMPLE TYPE	BLOWS/ft	GRAPHIC LOG	MATERIAL DESCRIPTION	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	REMARKS
0				**Silty SAND (SM)** - medium dense, brown, moist, fine to medium grained				
5	CAL	2-2-2 (4)			105.9	5.5	S = 26 %	
10	SPT	3-2-3 (5)		**Sandy LEAN CLAY (CL)** - medium stiff, brown, moist		19.9		
15	CAL	6-8-10 (18)		Stiff	87.0	14.4	S = 42 %	
20	SPT	11-16-21 (37)		**Clayey SAND (SC)** - dense, brown, moist, fine to medium grained				

NOTES:
1. Bottom of boring at 21.5 feet.
2. No groundwater encountered.
3. Boring backfilled with auger cuttings.

BOREHOLE - TECHNICON.GDT - 8/29/24 08:34 - Z:\TESDATA\PROJECTS\PROJECTS\240400- 240499\240426 PHASE 3 MODULAR BUILDING ADDITION\240426 - GINT.GPJ

TECHNICON Engineering Services, Inc.
4539 N. Brawley Avenue #108
Fresno, California 93722
Telephone: 559.276.9311

BORING B-2

PROJECT NAME Proposed Phase 3 Modular Building Addition
PROJECT NUMBER 240426
PROJECT LOCATION Merced, California
SURFACE DESCRIPTION Bare soil & weeds
DATE STARTED 7/26/24 **COMPLETED** 7/26/24
GROUND ELEVATION 0 ft
DRILLING CONTRACTOR TECHNICON Engineering Services, Inc.
GROUND WATER LEVEL No groundwater encountered.
DRILL RIG TYPE SIMCO 2800
BORING DEPTH 56.5 ft
DRILLING METHOD 4-inch Solid Flight Auger
LOGGED BY C. Odneal **CHECKED BY** A. AhTye

DEPTH (ft)	SAMPLE TYPE	BLOWS/ft	GRAPHIC LOG	MATERIAL DESCRIPTION	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	REMARKS
0				**Silty SAND (SM)** - medium dense, brown, moist, fine to medium grained				
	CAL	5-8-9 (17)			108.7	2.9	S = 15 %	
	GB							
5				**Sandy LEAN CLAY (CL)** - medium stiff, brown, moist				
	CAL	6-5-4 (9)			111.0	16.0	S = 87 %	
10								
	SPT	4-20-31 (51)		Reddish brown, increased sand, trace fine gravel				
15				**Clayey SAND (SC)** - medium dense, brown, moist, fine to medium grained				
	CAL	8-12-13 (25)			112.9	7.6	S = 43 %	
20				**Poorly Graded SAND (SP)** - medium dense, brown, moist, fine to medium grained, trace silt				
	SPT	7-8-10 (18)				5.9		
25								
	CAL	12-19-26 (45)		Dense, trace clay	108.6	6.6	S = 34 %	
30				**Silty SAND (SM)** - medium dense, brown, moist, fine to medium grained				
	SPT	9-11-14 (25)				12.4		
35								

(Continued Next Page)

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TECHNICON Engineering Services, Inc.
4539 N. Brawley Avenue #108
Fresno, California 93722
Telephone: 559.276.9311

BORING B-2

PROJECT NAME Proposed Phase 3 Modular Building Addition
PROJECT NUMBER 240426
PROJECT LOCATION Merced, California
SURFACE DESCRIPTION Bare soil & weeds
DATE STARTED 7/26/24 **COMPLETED** 7/26/24
GROUND ELEVATION 0 ft
DRILLING CONTRACTOR TECHNICON Engineering Services, Inc.
GROUND WATER LEVEL No groundwater encountered.
DRILL RIG TYPE SIMCO 2800
BORING DEPTH 56.5 ft
DRILLING METHOD 4-inch Solid Flight Auger
LOGGED BY C. Odneal **CHECKED BY** A. AhTye

DEPTH (ft)	SAMPLE TYPE	BLOWS/ft	GRAPHIC LOG	MATERIAL DESCRIPTION	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	REMARKS
35	CAL	10-18-20 (38)		**Silty SAND (SM)** - medium dense, brown, moist, fine to medium grained *(continued)*	108.7	8.7	S = 44 %	
40	SPT	10-10-11 (21)						
45	CAL	13-20-22 (42)		**Poorly Graded SAND (SP)** - dense, light brown, moist, fine to medium grained, trace silt	98.8	5.7	S = 22 %	
50	SPT	9-14-22 (36)				6.9		
55	SPT	9-10-12 (22)		Medium dense				

NOTES:
1. Bottom of boring at 56.5 feet.
2. No groundwater encountered.
3. Boring backfilled with auger cuttings.

TECHNICON Engineering Services, Inc.
4539 N. Brawley Avenue #108
Fresno, California 93722
Telephone: 559.276.9311

BORING B-3

PROJECT NAME Proposed Phase 3 Modular Building Addition
PROJECT NUMBER 240426
PROJECT LOCATION Merced, California
SURFACE DESCRIPTION Bare soil & weeds
DATE STARTED 7/26/24 **COMPLETED** 7/26/24
GROUND ELEVATION 0 ft
DRILLING CONTRACTOR TECHNICON Engineering Services, Inc.
GROUND WATER LEVEL No groundwater encountered.
DRILL RIG TYPE SIMCO 2800
BORING DEPTH 21.5 ft
DRILLING METHOD 4-inch Solid Flight Auger
LOGGED BY C. Odneal **CHECKED BY** A. AhTye

DEPTH (ft)	SAMPLE TYPE	BLOWS/ft	GRAPHIC LOG	MATERIAL DESCRIPTION	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	REMARKS
0								
5	GB			**Silty SAND (SM)** - dense, brown, moist, fine to medium grained				
	SPT	20-36-30 (66)						
10	CAL	8-10-20 (30)		Medium dense	109.8	8.9	S = 46 %	
15	SPT	6-13-17 (30)		**Sandy LEAN CLAY (CL)** - very stiff, brown, moist				
20	CAL	12-36-42 (78)		**Clayey SAND (SC)** - very dense, brown, moist, fine to medium grained	116.7	15.3	S = 97 %	

NOTES:
1. Bottom of boring at 21.5 feet.
2. No groundwater encountered.
3. Boring backfilled with auger cuttings.

BOREHOLE - TECHNICON.GDT - 8/29/24 08:34 - Z:\TESDATA\PROJECTS\PROJECTS\240400- 240499\240426 PHASE 3 MODULAR BUILDING ADDITION\240426 - GINT.GPJ

TECHNICON Engineering Services, Inc.
4539 N. Brawley Avenue #108
Fresno, California 93722
Telephone: 559.276.9311

BORING B-4

PROJECT NAME Proposed Phase 3 Modular Building Addition
PROJECT NUMBER 240426
PROJECT LOCATION Merced, California
SURFACE DESCRIPTION Bare soil & weeds
DATE STARTED 7/26/24 **COMPLETED** 7/26/24
GROUND ELEVATION 0 ft
DRILLING CONTRACTOR TECHNICON Engineering Services, Inc.
GROUND WATER LEVEL No groundwater encountered.
DRILL RIG TYPE SIMCO 2800
BORING DEPTH 21.5 ft
DRILLING METHOD 4-inch Solid Flight Auger
LOGGED BY C. Odneal **CHECKED BY** A. AhTye

DEPTH (ft)	SAMPLE TYPE	BLOWS/ft	GRAPHIC LOG	MATERIAL DESCRIPTION	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	REMARKS
0				**Silty SAND (SM)** - very dense, brown, moist				
	CAL	17-33-33 (66)			98.3	18.0	S = 70 %	
5								
	CAL	5-5-6 (11)		Medium dense	101.7	13.2	S = 56 %	
10								
	SPT	8-11-11 (22)		Increased sand				
				Sandy LEAN CLAY (CL) - very stiff, reddish brown, moist				
15								
	CAL	10-13-20 (33)			116.4	15.0	S = 95 %	
				Silty SAND (SM) - medium dense, brown, moist, fine to medium grained				
20								
	SPT	8-12-11 (23)				12.9		

NOTES:
1. Bottom of boring at 21.5 feet.
2. No groundwater encountered.
3. Boring backfilled with auger cuttings.

BOREHOLE - TECHNICON.GDT - 8/29/24 08:34 - Z:\TESDATA\PROJECTS\PROJECTS\240400- 240499\240426 PHASE 3 MODULAR BUILDING ADDITION\240426 - GINT.GPJ

TECHNICON Engineering Services, Inc.
4539 N. Brawley Avenue #108
Fresno, California 93722
Telephone: 559.276.9311

BORING B-5

PROJECT NAME Proposed Phase 3 Modular Building Addition
PROJECT NUMBER 240426
PROJECT LOCATION Merced, California
SURFACE DESCRIPTION Bare soil & weeds
DATE STARTED 7/26/24 **COMPLETED** 7/26/24
GROUND ELEVATION 0 ft
DRILLING CONTRACTOR TECHNICON Engineering Services, Inc.
GROUND WATER LEVEL No groundwater encountered.
DRILL RIG TYPE SIMCO 2800
BORING DEPTH 16.5 ft
DRILLING METHOD 4-inch Solid Flight Auger
LOGGED BY C. Odneal **CHECKED BY** A. AhTye

DEPTH (ft)	SAMPLE TYPE	BLOWS/ft	GRAPHIC LOG	MATERIAL DESCRIPTION	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	REMARKS
0				**Silty SAND (SM)** - dense, brown, moist				
	CAL	12-21-15 (36)			109.7	1.7	S = 9 %	
5	SPT	2-2-3 (5)		**Sandy LEAN CLAY (CL)** - medium dense, brown, moist				
10	CAL	50/5"		Hard	102.6	11.4	S = 49 %	
15	SPT	6-11-15 (26)		**Silty SAND (SM)** - medium dense, brown, moist, fine to medium grained				

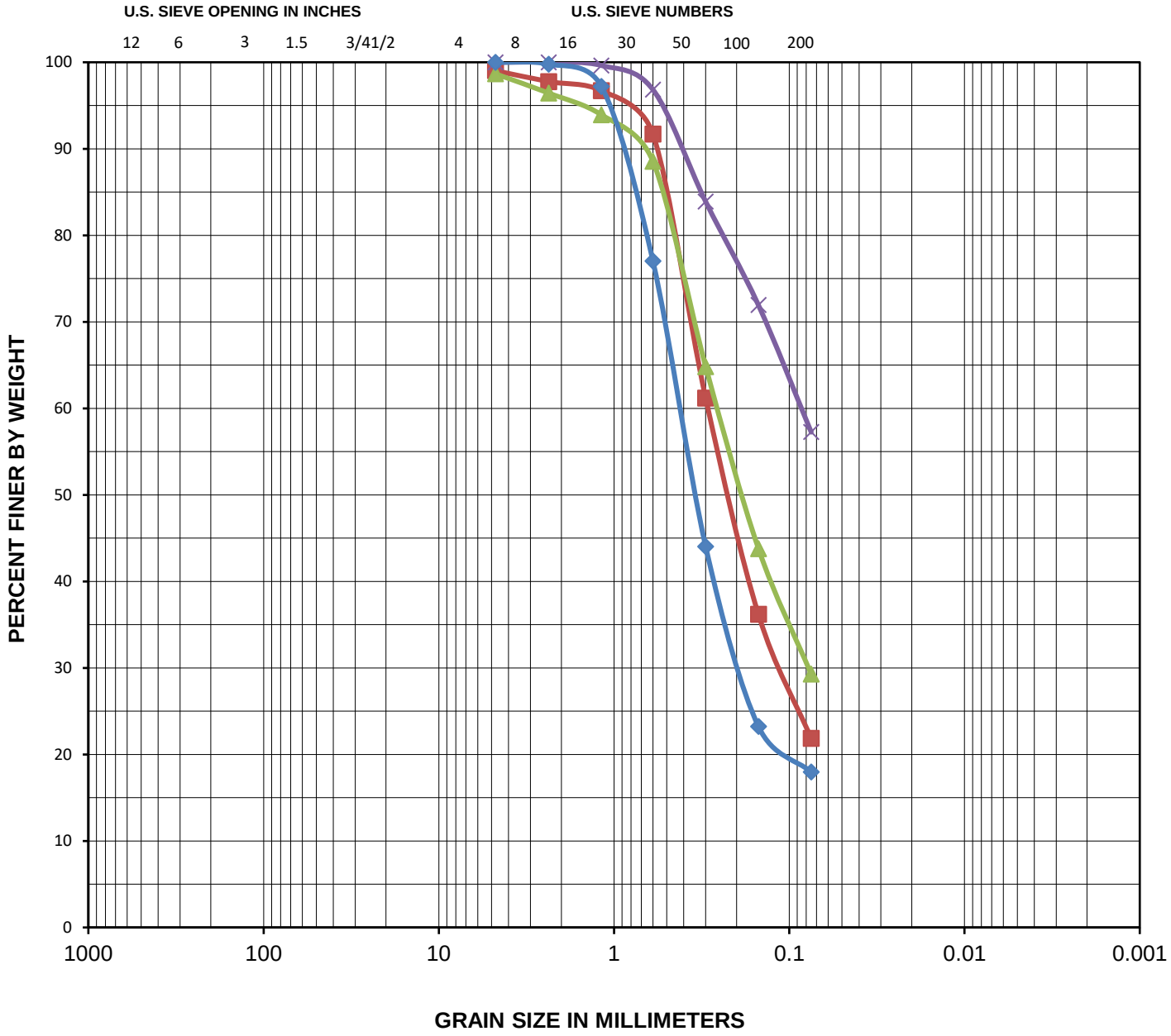
NOTES:
1. Bottom of boring at 16.5 feet.
2. No groundwater encountered.
3. Boring backfilled with auger cuttings.

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LABORATORY TESTS

APPENDIX B

BOULDER	COBBLE	GRAVEL		SAND			SILT	CLAY
		coarse	fine	coarse	medium	fine		



Boring	Depth (ft.)	Sample Description	Passing 3/4"	Passing #4	Passing #200
B-3	0-5	Silty SAND (SM)	100.0	99.0	21.8
B-2	0-5	Silty SAND (SM)	100.0	98.7	29.3
B-1	10	Sandy CLAY (CL)	100.0	100.0	57.3
B-4	20	Silty SAND (SM)	100.0	100.0	18.0

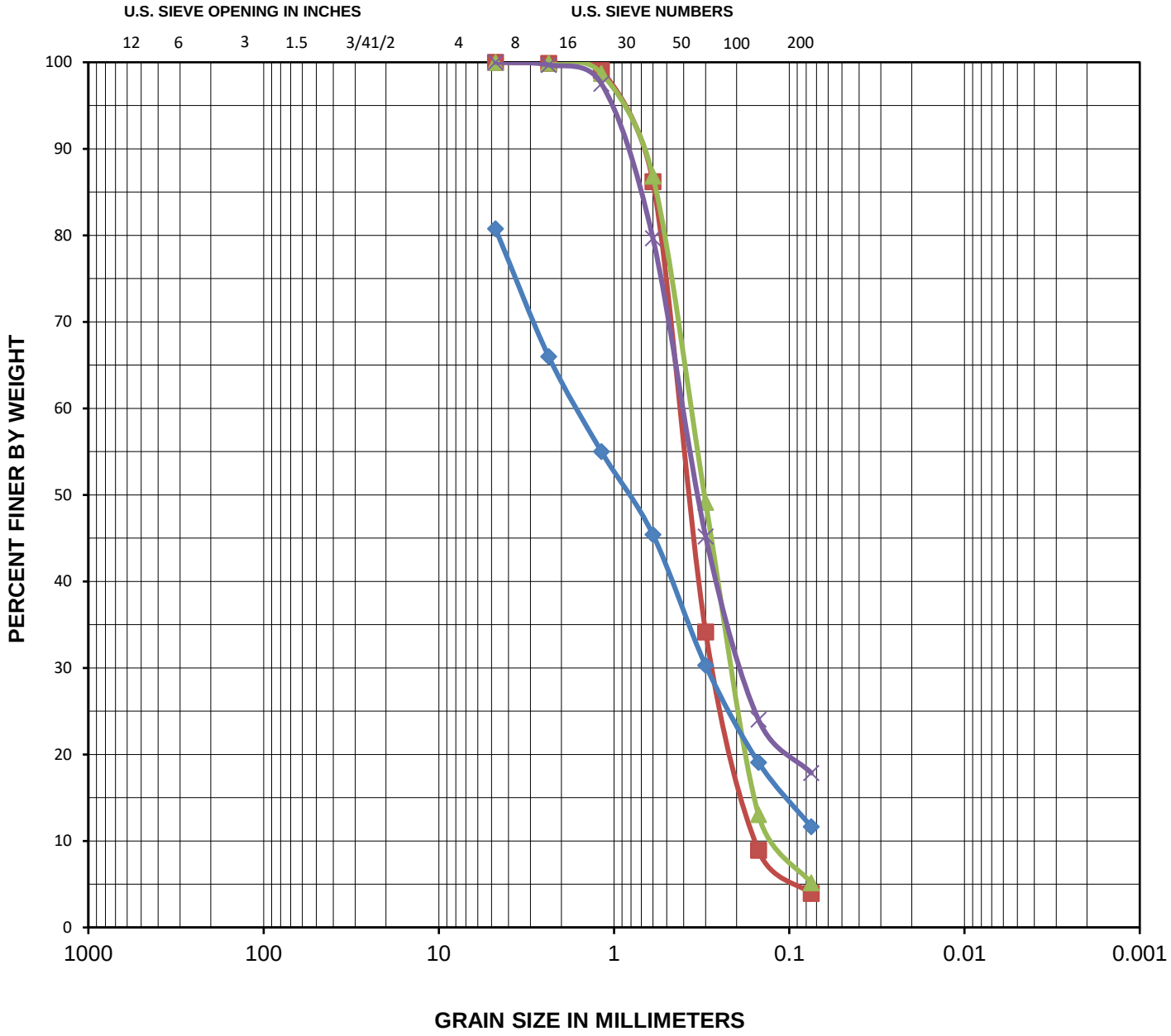
PROJECT NO.:	240426
LAB TECH:	SA
INPUT BY:	SA
CHECKED BY:	SA
DATE:	8/23/2024
REVISED:	-

SIEVE ANALYSIS

PHASE 3 MODULAR BUILDING ADDITION
2736 FRANKLIN RD
MERCED, CA

TECHNICON
ENGINEERING SERVICES, INC.

BOULDER	COBBLE	GRAVEL		SAND			SILT	CLAY
		coarse	fine	coarse	medium	fine		



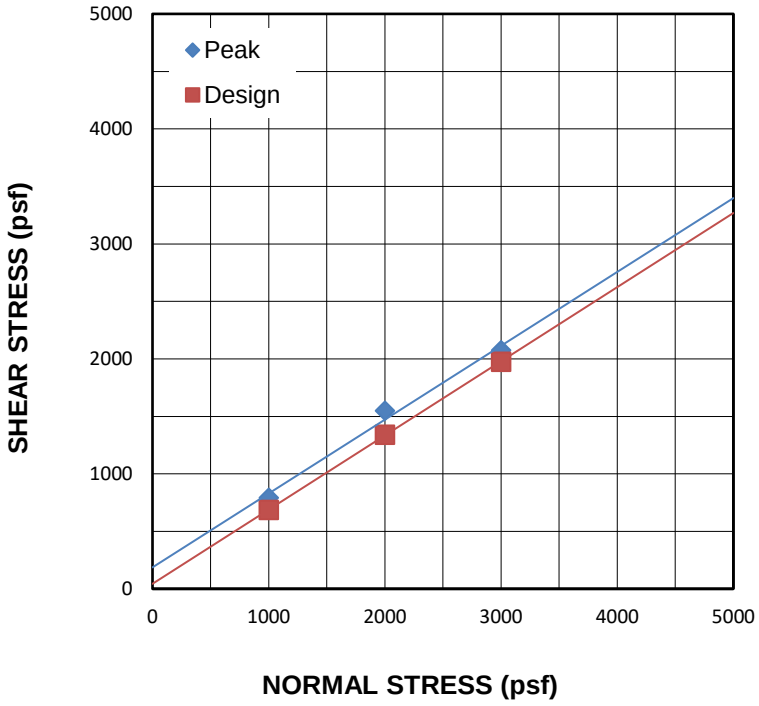
Boring	Depth (ft.)	Sample Description	Passing 3/4"	Passing #4	Passing #200
B-2	20	Poorly Graded SAND (SP)	100.0	100.0	3.9
B-2	50	Poorly Graded SAND (SP)	100.0	100.0	5.2
B-2	30	Silty SAND (SM)	100.0	100.0	17.9
B-4	2	Silty SAND (SM)	100.0	80.8	11.6

PROJECT NO.:	240426
LAB TECH:	SA
INPUT BY:	SA
CHECKED BY:	SA
DATE:	8/23/2024
REVISED:	-

SIEVE ANALYSIS

PHASE 3 MODULAR BUILDING ADDITION
2736 FRANKLIN RD
MERCED, CA

TECHNICON
ENGINEERING SERVICES, INC.



	Depth (ft.)	Sample Description
B-2	1	SILTY SAND (SM)

	Specimen No.	Dry Unit Weight (pcf)	Water Content (%)	Saturation (%)	Area (in^2)	Height (in)
Initial	1	108.72	2.88	14.6	4.60	1.00
	2	108.72	2.88	14.6	4.60	1.00
	3	108.72	2.88	14.6	4.60	1.00
At Test	Specimen No.	Dry Unit Weight (pcf)	Water Content (%)	Saturation (%)	Area (in^2)	Height (in)
	1	109.3	16.4	84.8	4.60	0.995
	2	110.8	16.3	87.8	4.60	0.981
	3	109.0	15.8	81.0	4.60	0.997

Specimen No.	Peak Shear Stress (psf)	Design Shear Stress (psf)	Normal Stress (psf)	Strain Rate (in/min)
1	790.4	685.6	1000	0.005
2	1548.5	1339.9	2000	0.005
3	2074.9	1975.5	3000	0.005

Results	Cohesion (psf)	Friction ϕ (deg)
Peak	187	32.7
Design	44	32.8

PROJECT NO	240426
LAB TECH:	
INPUT BY:	CO
CHECKED BY	SA
DATE:	8/23/2024
REVISED:	-

DIRECT SHEAR

PHASE 3 MODULAR BUILDING ADDITION
2736 FRANKLIN RD
MERCED, CA

TECHNICON
ENGINEERING SERVICES, INC.

Boring	Depth (ft.)	Sample Description
B-2	0-5	SILTY SAND (SM)

Moisture		
Wet Weight (g)	Dry Weight (g)	Water Content (%)
200.0	183.9	8.8

Soil Specimen		
Mold Weight (g)	Soil + Mold Weight (g)	Soil Weight (g)
367.3	776.4	409.1
Mold Diameter (in)	Mold Height (in)	Mold Volume (ft^3)
4.0	1.0	12.57
Moist Density (pcf)	Dry Density (pcf)	Saturation (%)
123.4	113.4	48.7

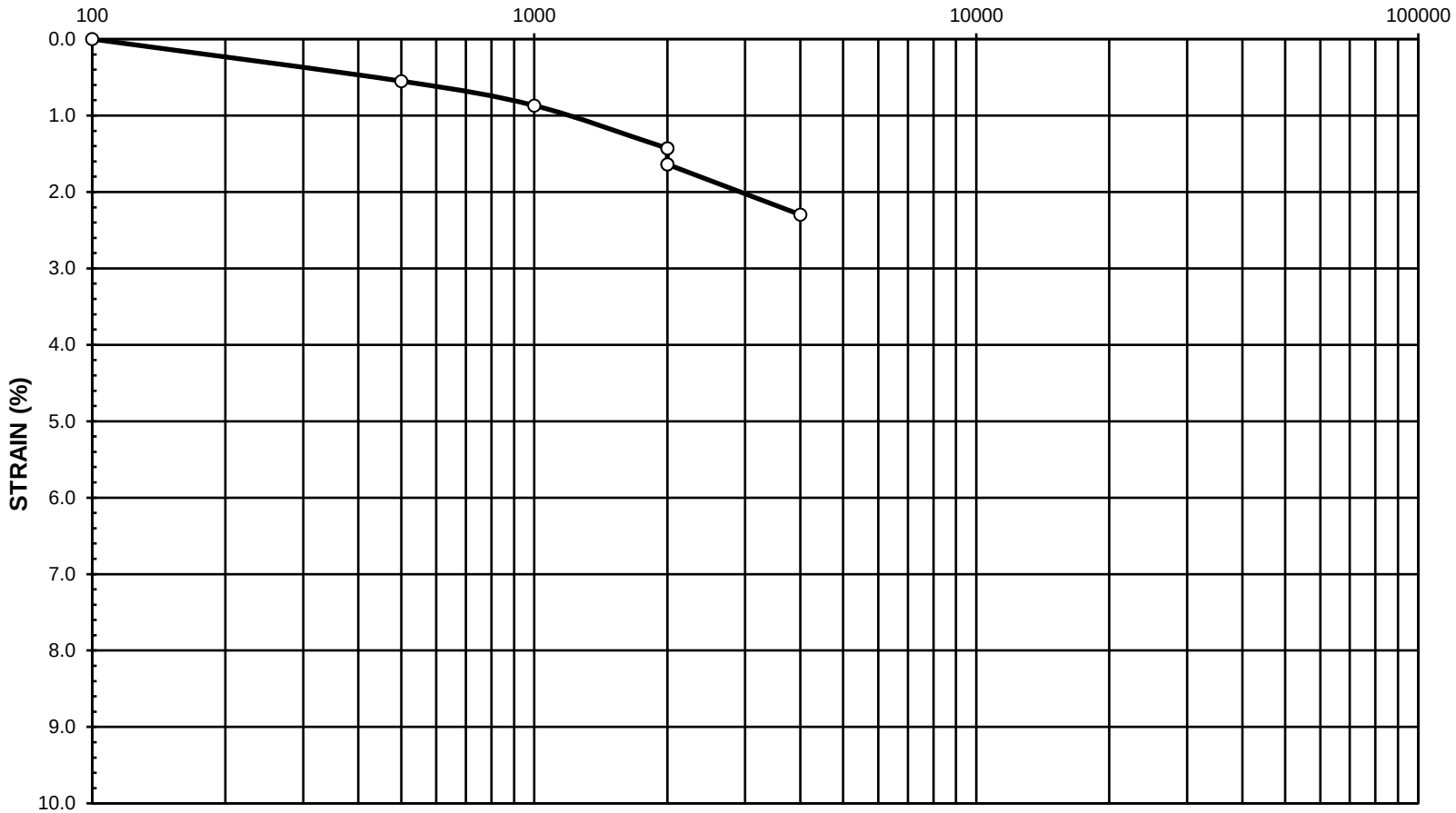
Expansion		
Initial Reading (in)	Final Reading (in)	Expansion (in)
0.0000	0.0001	0.0001

Expansion Index, EI	
$EI_{measured}$	EI_{50}
0.1	0.0

Expansion Index, EI	Potential Expansion
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
> 130	Very High

Testing performed in general accordance with ASTM D4829

PROJECT NO	240426	EXPANSION INDEX	TECHNICON ENGINEERING SERVICES, INC.
LAB TECH:			
INPUT BY:	CO	PHASE 3 MODULAR BUILDING ADDITION	
CHECKED BY	SA	2736 FRANKLIN RD	
DATE:	8/23/2024	MERCED, CA	
REVISED:	-		



Boring	Depth (ft)	Sample Description
B-4	5.0	Sandy SILT (ML)

	Sample Diameter (in)	Sample Height (in)	Moisture Content (%)	Dry Density (pcf)
Initial	2.42	1.0010	13.2	97.7
Final	2.42	0.9780	20.9	99.9

PROJECT NO.:	240426
LAB TECH:	WJD
INPUT BY:	CO
CHECKED BY:	SA
DATE:	8/23/2024
REVISED:	-

COLLAPSE POTENTIAL

PHASE 3 MODULAR BUILDING ADDITION
2736 FRANKLIN RD
MERCED, CA

TECHNICON
ENGINEERING SERVICES, INC.

Boring	Depth (ft)	Sample Description
B-2	0-5	Silty SAND (SM)

MINIMUM RESISTIVITY

Water Added (ml)	0	150	250	350	450				
Resistance (ohm)	1,000,000	8,300	5,000	4,600	4,700				
Resistivity (ohm-cm)*	1,065,000	8,840	5,325	4,899	5,006				

Box Constant=1.065

Minimum Resistivity (ohm-cm)	4,899

pH	7.17

Years to perforation*	30

* Caltrans California Test 643 - Method for Estimating the Service Life of Steel Culverts

CHEMICAL ANALYSIS

Soluble Sulfate SO_4-S	Soluble Chloride Cl
4.9 mg/kg	10.6 mg/kg
6.2 mg/kg	8.9 mg/kg
5.8 mg/kg	10.6 mg/kg
Average: 5.6 mg/kg	Average: 10.0 mg/kg

Testing performed in general accordance with California Test Method Nos. 643, 417, and 422

PROJECT NO.:	240426
LAB TECH:	
INPUT BY:	CO
CHECKED BY:	SA
DATE:	8/23/2024
REVISED:	-

CORROSIVITY TESTS

PHASE 3 MODULAR BUILDING ADDITION
2736 FRANKLIN RD
MERCED, CA

TECHNICON
ENGINEERING SERVICES, INC.

USGS DEAGGREGATION SUMMARIES

APPENDIX C

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Please also see the new USGS Earthquake Hazard Toolbox for access to the most recent NSHMs for the conterminous U.S. and Hawaii.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

37.3271

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western longitudes

-120.54

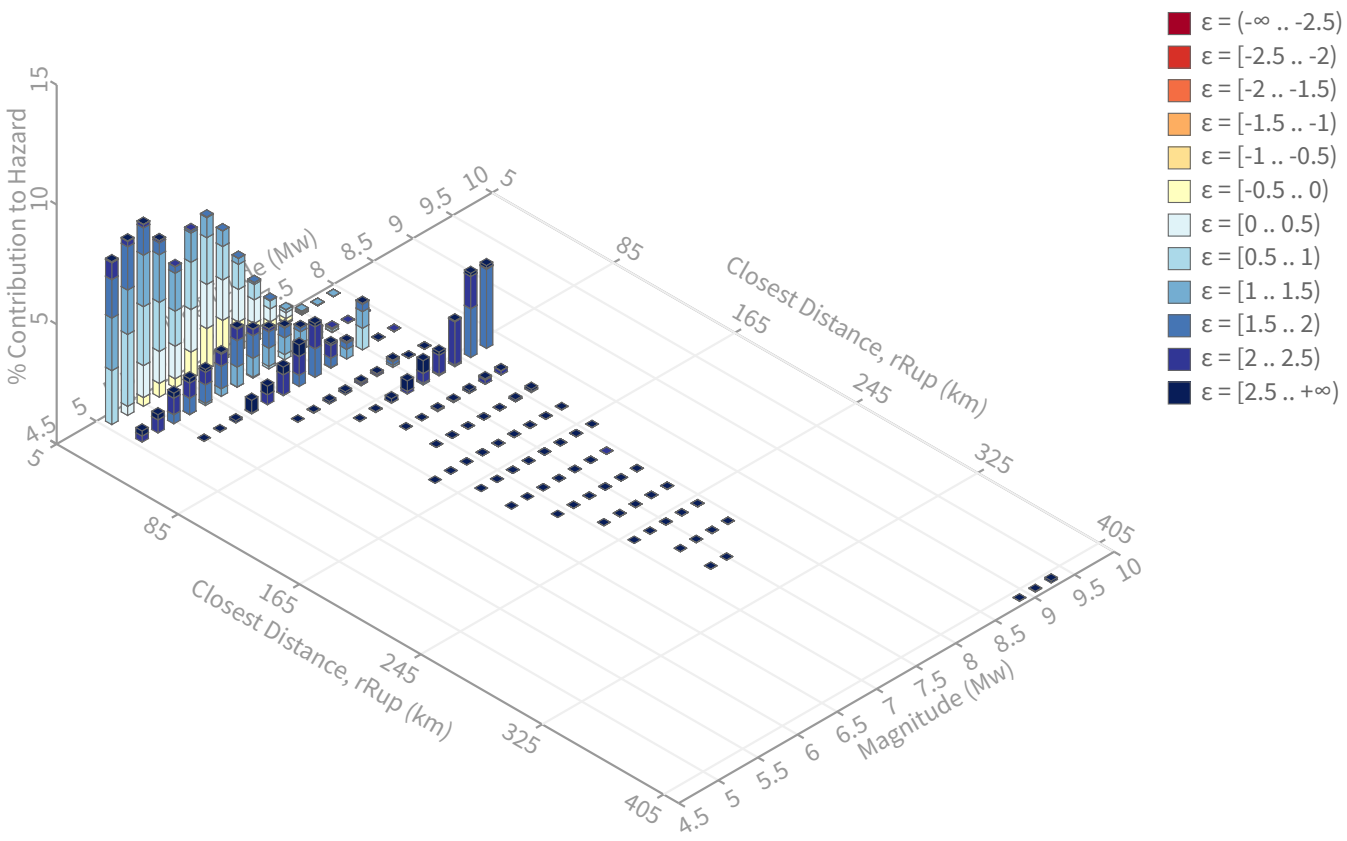
Site Class

259 m/s (Site class D)

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.34572825 g

Recovered targets

Return period: 2813.0453 yrs
Exceedance rate: 0.00035548664 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.17 %

Mean (over all sources)

m: 6.35
r: 29.21 km
ε_0: 1.21 σ

Mode (largest m-r bin)

m: 5.5
r: 10.9 km
ε_0: 0.93 σ
Contribution: 7.6 %

Mode (largest m-r-ε_0 bin)

m: 8.27
r: 98.26 km
ε_0: 1.83 σ
Contribution: 3.3 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM31 (opt)	Grid							39.18
PointSourceFinite: -120.540, 37.368		6.69	5.69	0.33	120.540°W	37.368°N	0.00	2.88
PointSourceFinite: -120.540, 37.368		6.69	5.69	0.33	120.540°W	37.368°N	0.00	2.88
PointSourceFinite: -120.540, 37.386		7.94	5.74	0.49	120.540°W	37.386°N	0.00	2.56
PointSourceFinite: -120.540, 37.386		7.94	5.74	0.49	120.540°W	37.386°N	0.00	2.56
PointSourceFinite: -120.540, 37.458		13.69	5.98	1.02	120.540°W	37.458°N	0.00	2.40
PointSourceFinite: -120.540, 37.458		13.69	5.98	1.02	120.540°W	37.458°N	0.00	2.39
PointSourceFinite: -120.540, 37.404		9.29	5.80	0.64	120.540°W	37.404°N	0.00	1.45
PointSourceFinite: -120.540, 37.404		9.29	5.80	0.64	120.540°W	37.404°N	0.00	1.45
PointSourceFinite: -120.540, 37.413		10.00	5.83	0.71	120.540°W	37.413°N	0.00	1.43
PointSourceFinite: -120.540, 37.413		10.00	5.83	0.71	120.540°W	37.413°N	0.00	1.43
UC33brAvg_FM32 (opt)	Grid							39.12
PointSourceFinite: -120.540, 37.368		6.69	5.69	0.33	120.540°W	37.368°N	0.00	2.88
PointSourceFinite: -120.540, 37.368		6.69	5.69	0.33	120.540°W	37.368°N	0.00	2.88
PointSourceFinite: -120.540, 37.386		7.94	5.74	0.49	120.540°W	37.386°N	0.00	2.56
PointSourceFinite: -120.540, 37.386		7.94	5.74	0.49	120.540°W	37.386°N	0.00	2.55
PointSourceFinite: -120.540, 37.458		13.69	5.98	1.02	120.540°W	37.458°N	0.00	2.39
PointSourceFinite: -120.540, 37.458		13.69	5.98	1.02	120.540°W	37.458°N	0.00	2.39
PointSourceFinite: -120.540, 37.404		9.29	5.80	0.64	120.540°W	37.404°N	0.00	1.45
PointSourceFinite: -120.540, 37.404		9.29	5.80	0.64	120.540°W	37.404°N	0.00	1.45
PointSourceFinite: -120.540, 37.413		10.00	5.83	0.71	120.540°W	37.413°N	0.00	1.43
PointSourceFinite: -120.540, 37.413		10.00	5.83	0.71	120.540°W	37.413°N	0.00	1.43
UC33brAvg_FM32	System							10.82
San Andreas (Creeping Section) [17]		98.26	8.12	2.02	121.309°W	36.695°N	224.39	3.92
Great Valley 09 (Laguna Seca) [0]		47.85	6.74	2.01	120.987°W	37.095°N	237.03	1.13
Calaveras (Central) [0]		89.83	7.71	2.28	121.495°W	37.067°N	251.44	1.05
UC33brAvg_FM31	System							10.75
San Andreas (Creeping Section) [17]		98.26	8.12	2.02	121.309°W	36.695°N	224.39	3.86
Great Valley 09 (Laguna Seca) [0]		47.85	6.74	2.01	120.987°W	37.095°N	237.03	1.24
Calaveras (Central) [0]		89.83	7.71	2.28	121.495°W	37.067°N	251.44	1.03

SITE SPECIFIC GROUND MOTION ANALYSIS

APPENDIX D

Site-Specific Ground Motion Analysis (per ASCE 7-16)

Technicon Engineering Services, Inc.	
Project:	Proposed Phase 3 Modular Building Addition
Job #:	240426
Date:	8/29/2024
Checked by:	S. Alvarez

S_S	0.575
S_1	0.238
S_{DS}	0.513
PGA_M	0.329
F_a	1.34

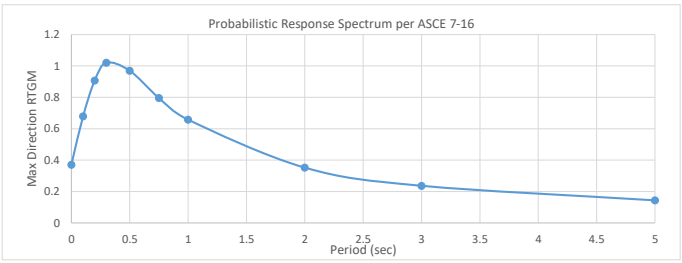
TECHNICON ENGINEERING SERVICES, INC.

https://seismicmaps.org/ ** Values input from OSHPD seismic design map

INPUT
OUTPUT
ANALYSIS

1. Use Unified Hazard Tool "raw data" from Hazard Curve & Risk-Targeted Ground Motion Calculator to get "UHGM & RTGM" values
   a. Plot time vs. adjusted RTGM
2. Input M_w and R_{rup} into NGAW2 Excel worksheet. M_w & R_{rup} can be found with deagg sheet (unified hazard tool) "Mean (over all sources)".
   a. PS_a Median + 5% damping is 84th – percentile spectral acceleration

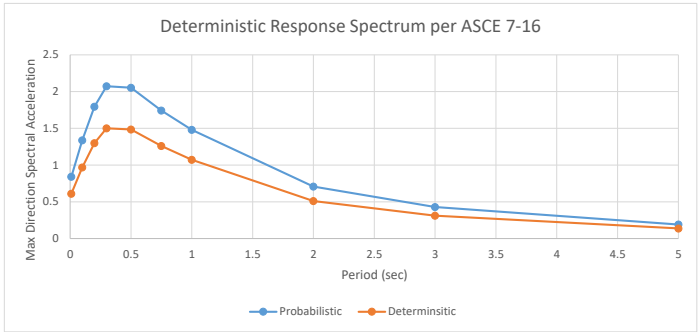
	* from RTGM Calculator			
Period (s)	UHGM (g)	RTGM (g)	Max Dir Scale Factor	Max Dir RTGM (g)
0	0.346	0.337	1.1	0.3707
0.1	0.635	0.617	1.1	0.6787
0.2	0.87	0.825	1.1	0.9075
0.3	0.931	0.907	1.125	1.020375
0.5	0.849	0.825	1.175	0.969375
0.75	0.667	0.643	1.2375	0.7957125
1	0.525	0.506	1.3	0.6578
2	0.275	0.261	1.35	0.35235
3	0.18	0.169	1.4	0.2366
5	0.105	0.096	1.5	0.144



Scaling Factor: 0.723636271

*From NGA-West2 GMPE Worksheet

Period (s)	84th- percentile spectral acceleration (+1. σ for 5 % damping)	Max Dir Scale Factor	Max Dir Deterministic SA (prob.)	ASCE 7-16 SECTION 21.2.2 (Det.)
0.01	0.765554769	1.1	0.842110246	0.609381518
0.1	1.215911437	1.1	1.337502581	0.967865381
0.2	1.631723809	1.1	1.79489619	1.298851987
0.3	1.842546299	1.125	2.072864586	1.5
0.5	1.746592572	1.175	2.052246273	1.485079841
0.75	1.40775542	1.2375	1.742097332	1.260644818
1	1.138665201	1.3	1.480264762	1.071173273
2	0.523209111	1.35	0.7063323	0.511127672
3	0.306668699	1.4	0.429336178	0.310683231
5	0.126873401	1.5	0.190310102	0.137715293



- ASCE 7-16 Section 21.2.2

If Largest Deterministic Spectral acceleration < 1.5, then scaling by a factor of F_a1.5.

Table **11.4.1** : Site Class D @ $S_s \geq 1.5$ → $F_{a=}$ 1.34

F_a1.5 → $F_{a=}$ 2.01

- Section 21.3

F_v is taken as 2.4 for $S_1 < 0.2$ or 2.5 for $S_1 > 0.2$

Fv → 2.5

- Section 11.4.6 - Design Response Spectrum

$$T_0 = 0.2\left(\frac{S_{D1}}{S_{DS}}\right) \qquad T_S = \left(\frac{S_{D1}}{S_{DS}}\right)$$

equ. 11.4-2: $S_{M1} = S_1 * F_V$ → 0.8925

equ. 11.4-4: $S_{D1} = \left(\frac{2}{3}\right) S_{M1}$ → 0.595

T_0 → 0.232

T_S → 1.160

S_S	0.575
S_1	0.238
S_{DS} * from seismic design map	0.513
S_{D1} * from section 11.4.6	0.595
T_0	0.232
T_S	1.160

Site-Specific Ground Motion Analysis (per ASCE 7-16) - cont.

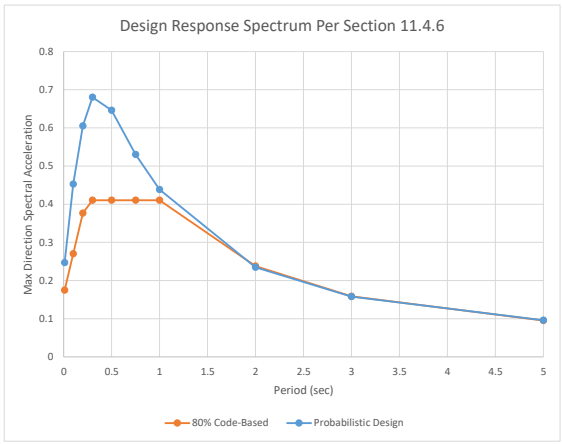
Technicon Engineering Services, Inc.

Project:	**Proposed Phase 3 Modular Building Addition**
Job #:	**240426**
Date:	**8/29/2024**
Checked by:	**S. Alvarez**

TECHNICON ENGINEERING SERVICES, INC.

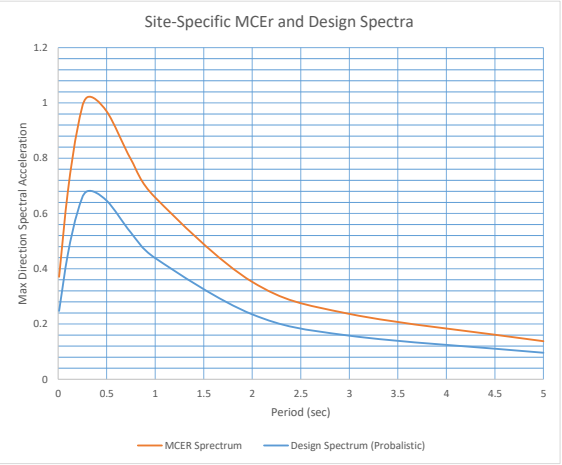
INPUT
OUTPUT
ANALYSIS

S_S	**0.575**
S_1	**0.238**
S_{DS}	**0.513**
PGA_M	**0.329**
F_a	**1.34**



Site-Specfic Response Spectra (Section 11.4.6)

Period (T) (sec)	Code-Base -Spectrum Design spectral response acceleration (S_a)	*make sure below applies to period (T sec)	80% Code-Based	S_a=(2/3)(S_{am}) (prob. Design)	(Sec. 21.4) T*S_a
0.01	0.218469025	T less than T_o	0.17477522	0.247133333	0.002471333
0.1	0.337890252		0.270312202	0.452466667	0.045246667
0.2	0.470580504		0.376464403	0.605	0.121
0.3	0.513	$T_0 < T < T_S$; $T = S_{DS}$	0.4104	0.68025	0.204075
0.5	0.513		0.4104	0.64625	0.323125
0.75	0.513		0.4104	0.530475	0.39785625
1	0.513		0.4104	0.438533333	0.438533333
2	0.2975	$T > T_S$; $S_a = S_{D1}/T$	0.238	0.2349	0.476
3	0.198333333		0.158666667	0.157733333	0.476
5	0.119		0.0952	0.096	0.48



- Section 21.4 Design Acceleration Parameters

Max S_a between T= 0.2 - 5 sec (From Design Spectrum (prob.) graph)

$S_{a\,max}$ → 0.68025

$S_{DS} = 90\% * S_{a\,max}$ → 0.612

$S_{MS} = 1.5 * S_{DS}$ → 0.918

V_{s30} < 365 m/s

Max T * S_a between T=1 sec - 5 sec (From Design Spectrum (prob.) graph)

Max S_a between T=1-5 sec → 0.48

S_{D1} → 0.480

$S_{M1} = 1.5 * S_{D1}$ S_{M1} → 0.720

- Section 21.5.1 - Probabilistic MCE_G Peak Ground Acceleration

Probablisitc PGA from UHGM @ T=0 sec

PGA_{prob} → 0.346

- Section 21.5.2 - Determinsitic MCE_G Peak Ground Acceleration

Determinsitic PGA from 84th Spectral Acceleration @ T=0.01 sec

PGA → 0.766

Table **11.8-1**: Site Class D @ PGA = 0.5 → F_{PGA} = 1.358

$0.5F_{PGA}$ = 0.679

Use greater of PGA or $0.5F_{PGA}$

Therefore; PGA_{det} → 0.765554769

- Section 21.5.3 - Site Specific MCE_G Peak Ground Acceleration

PGA_{prob} → 0.346

PGA_{det} → 0.679

*Take the lesser → PGA_{SS} 0.346

PGA CHECK

From Seismic Design Map: PGA_M → 0.329

80 % of PGA_M → 0.263

Site-Specific PGA → 0.346 *Take the greater

Final Seismic Design Values	
S_S	**0.575**
S_1	**0.238**
S_{MS}	**0.918**
S_{DS}	**0.612**
S_{D1}	**0.480**
S_{M1}	**0.720**
F_A	**1.340**
F_V	**2.500**
PGA_M	**0.346**

LIQUEFACTION ANALYSIS AND SEISMICALLY INDUCED SETTLEMENT CALCULATIONS

APPENDIX E

TECHNICON
ENGINEERING SERVICES, INC.

Proposed Phase 3 Modular Building Calc by AA Date 10/1/24
DSA File Checked by SA Date 10/1/24
DSA App No.

Project No: TES 240426
Boring: B-2

Liquefaction analysis is performed following Seed's Procedure, outlined by Seed and Harder (1990), as modified in 1998 NCEER Workshops. Reference Youd et al., 2001
****Includes revisions proposed by Youd (2001)**
The induced cyclic stress ratio (CSR) by a given peak ground acceleration (a_{max}) is:

******CSR = $(t_{av})/s'_{vo} = 0.65\ (s_{vo}/s'_{vo})(a_{max}/g)\ r_d$ MSF

where: ******Magnitude Scaling Factor, MSF =31.623*(exp(-0.4605*Mw))

******Stress Reduction Factor, r_d =

$$\frac{1.000-0.4113z^{0.5}+0.04052z+0.001753z^{1.5}}{1.00-0.4177z^{0.5}+0.05729z-0.006205z^{1.5}+0.001210z^{2}}$$

a_{max} = maximum peak acceleration at the ground surface (g's)
g = acceleration of gravity Mw = Moment Magnitude

The cyclic resistance ratio (CRR) is now read directly from the curve for clean sands under level ground conditions based on the corrected SPT value. This SPT N value is now corrected for earthquake magnitude, fines, energy, overburden pressure, & sampler factors. The CSR factors in a magnitude scaling factor and a stress reduction coefficient.

Factor of Safety, F_L is:

F_L = CRR / CSR = Uniform CSR necessary to trigger liquefaction/Equivalent, Uniform, earthquake induced CSR

Hammer Efficiencies - Technicon Drilling Rigs

CME 45	80.0%
CME 55	82.4%
CME 75	87.8%

Rod Length = **1.22** meters above grounds surface
Hammer Efficiency = **88%** Emean/E60 = Energy Ratio to correct to standard 60% Energy
Ring Sampler Corr. = **0.65**

Surcharge = Any surcharge on top of the ground (psf) [1]C_N = 2.2/(1.2+s'$_0$/P$_a$)Youd and Idriss 2001 Formula (10)

Emean/E60= 1.467 Sur.= 0 psf Measured Ground Water Depth = 100 feet Design Ground Water Depth = 5 feet acc. max = 0.346 g Earthq. Mw = 6.6

Depth to Bottom of Layer (ft.)	Boring Diameter (in)	Soil Type	Layer Thickness (ft.)	Total Overburden Press. σ_{vo} (tsf)	Effect. Overburden Press. σ'_{vo} (tsf) at Measured Ground Water Depth	Effect. Overburden Press. σ'_{vo} (tsf) at Design Ground Water Depth	Midpoint Below Ground Surface (m)	Cn	Total Unit Wt. (pcf) at Measured Ground Water Depth	Total Unit Wt. (pcf) at Design Ground Water Depth	Sampler Type 1 = SPT 2=Ca.Mod	Field Blow Count N	α	β	Stress Reduct. Coeff. rd	MSF	Est. % Fines	C_B	C_R	C_s	$C_BC_RC_s$	Corrected Blow Count $(N_1)_{60}$	$(N_1)_{60cs}$	$CSR_{7.5}$ Induced	$CRR_{7.5}$ (Resist. - c.sand)	Factor of Safety F_L	Will It Liquefy?
4	4	SM	4	0.11	0.11	0.11	0.6	1.69	114	114	2	17	3.925	1.093	0.995	1.51	22.0	1.1	0.75	1.00	0.83	22.7	28.8	0.148	0.401	2.71	ABOVE
5	4	SM	1	0.26	0.26	0.26	1.4	1.53	115	115	2	9	3.925	1.093	0.990	1.51	22.0	1.1	0.75	1.00	0.83	10.9	15.9	0.147	0.169	1.15	ABOVE
8	4	CL	3	0.38	0.38	0.34	2.0	1.42	120	130	2	9	5.000	1.200	0.985	1.51	65.0	1.0	0.80	1.00	0.80	9.8	16.7	0.163	0.178	1.09	NO
13	4	CL	5	0.62	0.62	0.51	3.2	1.24	120	130	1	51	5.000	1.200	0.976	1.51	65.0	1.0	0.85	1.20	1.02	95.0	119.0	0.175	LARGE	LARGE	NO
18	4	SC	5	0.92	0.92	0.68	4.7	1.08	120	130	2	25	5.000	1.200	0.964	1.51	57.0	1.0	0.85	1.00	0.85	21.8	31.2	0.193	LARGE	LARGE	NO
23	4	SP	5	1.22	1.22	0.85	6.2	0.95	125	132	1	18	0.000	1.000	0.952	1.51	4.0	1.0	0.95	1.20	1.14	28.5	28.5	0.203	0.387	1.91	NO
28	4	SP	5	1.52	1.52	1.02	7.8	0.85	115	130	2	45	0.000	1.000	0.941	1.51	4.0	1.0	0.95	1.00	0.95	34.5	34.5	0.208	LARGE	LARGE	NO
33	4	SM	5	1.81	1.81	1.19	9.3	0.77	116	130	1	25	3.234	1.066	0.926	1.51	18.0	1.0	1.00	1.20	1.20	33.7	39.2	0.209	LARGE	LARGE	NO
38	4	SM	5	2.10	2.10	1.36	10.8	0.70	118	130	2	38	3.234	1.066	0.885	1.51	18.0	1.0	1.00	1.00	1.00	25.4	30.3	0.203	LARGE	LARGE	NO
43	4	SM	5	2.39	2.39	1.53	12.3	0.65	115	130	1	21	3.234	1.066	0.844	1.51	18.0	1.0	1.00	1.20	1.20	23.9	28.7	0.196	0.396	2.02	NO
48	4	SP	5	2.67	2.67	1.69	13.9	0.60	105	123	2	42	0.000	1.000	0.804	1.51	5.0	1.0	1.00	1.00	1.00	24.1	24.1	0.189	0.275	1.46	NO
53	4	SP	5	2.93	2.93	1.84	15.4	0.40	105	123	1	36	0.000	1.000	0.763	1.51	5.0	1.0	1.00	1.20	1.20	25.3	25.3	0.180	0.299	1.66	NO
56.5	4	SP	3.5	3.15	3.15	1.97	16.7	0.40	105	123	1	22	0.000	1.000	0.728	1.51	5.0	1.0	1.00	1.20	1.20	15.5	15.5	0.173	0.165	0.95	YES

Proposed Phase 3 Modular Building Calc by AA Date 10/1/24
DSA File Checked by SA Date 10/1/24
DSA App No.

Project No: TES 240426
Boring: B-2

Liquefaction analysis is performed following Seed's Procedure, outlined by Seed and Harder (1990), as modified in 1998 NCEER Workshops. Reference Youd et al., 2001
****Includes revisions proposed by Youd (2001)**
The induced cyclic stress ratio (CSR) by a given peak ground acceleration (a_{max}) is:

******CSR = $(t_{av})/s'_{vo} = 0.65\ (s_{vo}/s'_{vo})(a_{max}/g)\ r_d$ MSF

where: ******Magnitude Scaling Factor, MSF =31.623*(exp(-0.4605*Mw))

******Stress Reduction Factor, r_d =

$$\frac{1.000-0.4113z^{0.5}+0.04052z+0.001753z^{1.5}}{1.00-0.4177z^{0.5}+0.05729z-0.006205z^{1.5}+0.001210z^{2}}$$

a_{max} = maximum peak acceleration at the ground surface (g's)
g = acceleration of gravity Mw = Moment Magnitude

The cyclic resistance ratio (CRR) is now read directly from the curve for clean sands under level ground conditions based on the corrected SPT value.
This SPT N value is now corrected for earthquake magnitude, fines, energy, overburden pressure, & sampler factors.
The CSR factors in a magnitude scaling factor and a stress reduction coefficient.

Settlement = e * Layer thickness in inches (Figure 9 1997 NCEER)

Rod Length = **1.22** meters above grounds surface
Hammer Efficiency = **88%** Emean/E60 = Energy Ratio to correct to standard 60% Energy
Ring Sampler Corr. = **0.65**

Surcharge = Any surcharge on top of the ground (psf)

[1] $C_N = (P_a/s'_{vo})^{0.5}$ Youd and Idriss 2001 Formula (9)

Emean/E60= 1.467 Sur.= 0 psf Measured Ground Water Depth = 100 feet Design Ground Water Depth = 5.0 feet acc. max = 0.346 g Earthq. Mw = 6.6

Depth to Bottom of Layer (ft.)	Boring Diameter (in)	Soil Type	Layer Thickness (ft.)	Total Overburden Press. σ_{vo} (tsf)	Effect. Overburden Press. σ'_{vo} (tsf) at Measured Ground Water Depth	Effect. Overburden Press. σ'_{vo} (tsf) at Design Ground Water Depth	Midpoint Below Ground Surface (ft)	Cn	Total Unit Wt. (pcf) at Measured Ground Water Depth	Total Unit Wt. (pcf) at Design Ground Water Depth	Sampler Type 1 = SPT 2=Ca.Mod	Field Blow Count N	Stress Reduct. Coeff. r_d	MSF	Est. % Fines	$C_B C_R C_S$	Corrected Blow Count $(N_1)_{60}$	ΔN	$(N_1)_{60cs}$	$CSR_{7.5}$ Induced	Factor of Safety F_L	ε (Only if FS<1.3) (%)	Settlement, inches
4	4	SM	4	0.11	0.11	0.11	0.6	1.69	114	114	2	17	0.995	1.51	22.0	0.83	22.7	1.8	24.5	0.148	2.71	-	ABOVE
5	4	SM	1	0.26	0.26	0.26	1.4	1.53	115	115	2	9	0.990	1.51	22.0	0.83	10.9	1.8	12.7	0.147	1.15	-	ABOVE
8	4	CL	3	0.38	0.38	0.34	2.0	1.42	120	130	2	9	0.985	1.51	65.0	0.80	9.8	5.2	14.9	0.163	1.09	-	0.0
13	4	CL	5	0.62	0.62	0.51	3.2	1.24	120	130	1	51	0.976	1.51	65.0	1.02	95.0	5.2	100.2	0.175	LARGE	-	NONE
18	4	SC	5	0.92	0.92	0.68	4.7	1.08	120	130	2	25	0.964	1.51	57.0	0.85	21.8	4.5	26.4	0.193	LARGE	-	NONE
23	4	SP	5	1.22	1.22	0.85	6.2	0.95	125	132	1	18	0.952	1.51	4.0	1.14	28.5	0.4	28.8	0.203	1.91	-	NONE
28	4	SP	5	1.52	1.52	1.02	7.8	0.85	115	130	2	45	0.941	1.51	4.0	0.95	34.5	0.4	34.8	0.208	LARGE	-	NONE
33	4	SM	5	1.81	1.81	1.19	9.3	0.77	116	130	1	25	0.926	1.51	18.0	1.20	33.7	1.5	35.2	0.209	LARGE	-	NONE
38	4	SM	5	2.10	2.10	1.36	10.8	0.70	118	130	2	38	0.885	1.51	18.0	1.00	25.4	1.5	26.9	0.203	LARGE	-	NONE
43	4	SM	5	2.39	2.39	1.53	12.3	0.65	115	130	1	21	0.844	1.51	18.0	1.20	23.9	1.5	25.3	0.196	2.02	-	NONE
48	4	SP	5	2.67	2.67	1.69	13.9	0.60	105	123	2	42	0.804	1.51	5.0	1.00	24.1	0.4	24.5	0.189	1.46	-	NONE
53	4	SP	5	2.93	2.93	1.84	15.4	0.40	105	123	1	36	0.763	1.51	5.0	1.20	25.3	0.4	25.8	0.180	1.66	-	NONE
56.5	4	SP	3.5	3.15	3.15	1.97	16.7	0.40	105	123	1	22	0.728	1.51	5.0	1.20	15.5	0.4	15.9	0.173	0.95	0.220	0.1

Total Settlement 0.1
May be off by 0.1 inches due to rounding

Proposed Phase 3 Modular Building
DSA File
DSA App No.

Calc by AA Date 10/1/24
Checked by SA Date 10/1/24

Project No: TES 240426
Boring: B-2

Dynamic Dry Sand Settlement

g_{cyc} = [(tav)/s'vo]/Gmax = 0.65 (a_{max} /g) s_o r_d / G_{max}

Where: $G_{max} = 20{,}000\ [(N_1)_{60,cs}]^{0.33}[s'_m]^{0.5}$

Stress Reduction Factor, r_d =

$$\frac{1.000-0.4113z^{0.5}+0.04052z+0.001753z^{1.5}}{1.00-0.4177z^{0.5}+0.05729z-0.006205z^{1.5}+0.001210z^{2}}$$

a_{max} = maximum peak acceleration at the ground surface (g's)
g = acceleration of gravity

Notes:
1) Figure 9.51, Geotechnical Earthquake Engineering, Kramer
2) Figure 9.52b, Geotechnical Earthquake Engineering, Kramer
3) Table 9-4, Geotechnical Earthquake Engineering, Kramer

Sur.= 0 psf | Measured Ground Water Depth = 100 feet | acc. max = 0.346 g | Earthq. Mw = 6.6

Elev. Base of Layer (ft)	Boring Diameter (in)	Soil Type	Layer Thickness (ft)	Depth to Midpoint (m)	Total Unit Wt. (pcf)	Total Overburden Pressure s_{vo} (psf)	Sampler Type 1 = SPT 2=Ca.Mod	Field Blow Count N (SPT)	Stress Reduct. Coeff. rd	$(N_1)_{60cs}$	g_{eff} (G_{eff}/G_{max})	Cyclic Overburden Pressure s_{vo} (tsf)	(1)Cyclic Shear Strain, g_{eff}	Cyclic Shear Strain, g_{eff} (%)	(2)Volumetric Strain, $e_{c,M=7.5}$ (%)	(3)Volumetric Strain Ratio ($e_{c,M}/e_{c,M=7.5}$)	Volumetric Strain, $e_{c,M}$ (%)	Multi Direction Vol. Strain (%)	Settlement (in)
4	**4**	**SM**	**4**	**0.6**	**114**	**228.0**	**2**	**17**	**0.995**	**28.8**	**6.84E-05**	**0.07**	**1.00E-04**	**1.00E-02**	**6.00E-03**	**0.7919**	**0.0048**	**0.0095**	**0.0046**
5	**4**	**SM**	**1**	**1.4**	**115**	**513.5**	**2**	**9**	**0.990**	**15.9**	**1.24E-04**	**0.17**	**2.20E-04**	**2.20E-02**	**3.00E-02**	**0.7919**	**0.0238**	**0.0475**	**0.0057**
8	4	CL	3	2.0	120	751.0	2	9	0.985	16.7	1.47E-04	0.24	3.80E-04	3.80E-02	5.50E-02	0.7919	0.0436	0.0871	0.0314
13	4	CL	5	3.2	120	1231.0	1	51	0.976	119.0	9.71E-05	0.40	3.00E-04	3.00E-02	1.60E-02	0.7919	0.0127	0.0253	0.0152
18	4	SC	5	4.7	120	1831.0	2	25	0.964	31.2	1.83E-04	0.60	0.00E+00	0.00E+00	0.00E+00	0.7919	0.0000	0.0000	0.0000
23	**4**	**SP**	**5**	**6.2**	**125**	**2443.5**	**1**	**18**	**0.952**	**28.5**	**2.15E-04**	**0.79**	**4.00E-04**	**4.00E-02**	**2.40E-02**	**0.7919**	**0.0190**	**0.0380**	**0.0228**
28	**4**	**SP**	**5**	**7.8**	**115**	**3043.5**	**2**	**45**	**0.941**	**34.5**	**2.22E-04**	**0.99**	**3.80E-04**	**3.80E-02**	**1.60E-02**	**0.7919**	**0.0127**	**0.0253**	**0.0152**
33	**4**	**SM**	**5**	**9.3**	**116**	**3621.0**	**1**	**25**	**0.926**	**39.2**	**2.29E-04**	**1.18**	**4.10E-04**	**4.10E-02**	**1.10E-02**	**0.7919**	**0.0087**	**0.0174**	**0.0105**
38	**4**	**SM**	**5**	**10.8**	**118**	**4206.0**	**2**	**38**	**0.885**	**30.3**	**2.57E-04**	**1.37**	**4.20E-04**	**4.20E-02**	**2.30E-02**	**0.7919**	**0.0182**	**0.0364**	**0.0219**
43	**4**	**SM**	**5**	**12.3**	**115**	**4788.5**	**1**	**21**	**0.844**	**28.7**	**2.66E-04**	**1.56**	**4.50E-04**	**4.50E-02**	**3.10E-02**	**0.7919**	**0.0245**	**0.0491**	**0.0295**
48	**4**	**SP**	**5**	**13.9**	**105**	**5338.5**	**2**	**42**	**0.804**	**24.1**	**2.84E-04**	**1.74**	**4.80E-04**	**4.80E-02**	**3.80E-02**	**0.7919**	**0.0301**	**0.0602**	**0.0361**
53	**4**	**SP**	**5**	**15.4**	**105**	**5863.5**	**1**	**36**	**0.763**	**25.3**	**2.77E-04**	**1.91**	**4.50E-04**	**4.50E-02**	**3.10E-02**	**0.7919**	**0.0245**	**0.0491**	**0.0295**
56.5	**4**	**SP**	**3.5**	**16.7**	**105**	**6309.8**	**1**	**22**	**0.728**	**15.5**	**3.24E-04**	**2.05**	**5.00E-04**	**5.00E-02**	**7.80E-02**	**0.7919**	**0.0618**	**0.1235**	**0.0519**

Total Settlement **0.23**