



TETER
ARCHITECTS ENGINEERS CONNECTED

PROJECT MANUAL

CONTRACTUAL – LEGAL REQUIREMENTS
TECHNICAL SPECIFICATIONS

FOR

STOCKTON UNIFIED SCHOOL DISTRICT

**ELOP RELOCATABLE –
HAZELTON ELEMENTARY SCHOOL**

Project No.: 23-12908

DSA File No.: 39-69

DSA Appl. No.: 02-122738

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT

APP: 02-122738 INC:

REVIEWED FOR

SS ☒ FLS ☒ ACS ☒

DATE: 11/21/2024

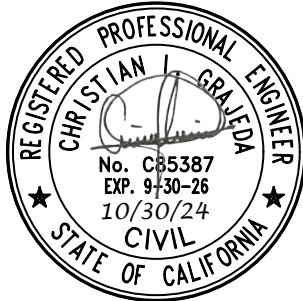
SECTION 000107
SEALS PAGE



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SECTION 000110
TABLE OF CONTENTS

INTRODUCTORY INFORMATION		PAGES
000101	PROJECT TITLE PAGE.....	1
000107	SEALS PAGE	2
000110	TABLE OF CONTENTS.....	4

DIVISION 00	CONTRACT REQUIREMENTS	PAGES
--------------------	------------------------------	--------------

TO BE PROVIDED BY OWNER

DIVISION 01	GENERAL REQUIREMENTS	PAGES
011100	SUMMARY OF WORK	5
011101	MULTIPLE CONTRACT SUMMARY.....	5
011103	ADDENDA.....	1
011105	USE OF ARCHITECT'S ELECTRONIC FILES	3
012500	SUBSTITUTION PROCEDURES.....	6
012600	CONTRACT MODIFICATION PROCEDURES	5
012605	DSA HOURLY FEE SERVICES.....	2
012613	REQUEST FOR INFORMATION (RFI)	4
012900	PAYMENT PROCEDURES	5
013113	PROJECT MANAGEMENT AND COORDINATION.....	6
013119	PROJECT MEETINGS	5
013200	CONSTRUCTION PROGRESS DOCUMENTATION.....	8
013233	PHOTOGRAPHIC DOCUMENTATION.....	2
013300	SUBMITTAL PROCEDURES.....	11
014000	QUALITY AND TESTING REQUIREMENTS	12
014200	REFERENCES	4
015000	TEMPORARY FACILITIES AND CONTROLS	11
015116	FIRE SAFETY DURING CONSTRUCTION	8
016000	PRODUCT REQUIREMENTS.....	7
017300	EXECUTION.....	10
017419	CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL	6
017700	CLOSEOUT PROCEDURES.....	6
017823	OPERATION AND MAINTENANCE DATA	9
017836	WARRANTIES.....	3
017839	PROJECT RECORD DRAWINGS	4
017900	DEMONSTRATION AND TRAINING	4
018113	SUSTAINABLE DESIGN REQUIREMENTS, DSA CALGREEN.....	6

DIVISION 02	EXISTING CONDITIONS	PAGES
--------------------	----------------------------	--------------

024119	SELECTIVE DEMOLITION.....	7
--------	---------------------------	---

DIVISION 03	CONCRETE	PAGES
033000	CAST-IN-PLACE CONCRETE.....	27
DIVISION 04	MASONRY	PAGES
(NOT USED)		
DIVISION 05	METALS	PAGES
055000	METAL FABRICATIONS.....	11
DIVISION 06	WOOD AND PLASTICS	PAGES
061053	MISCELLANEOUS ROUGH CARPENTRY.....	8
061626	UNDERLAYMENT	4
DIVISION 07	THERMAL AND MOISTURE PROTECTION	PAGES
072500	WEATHER RESISTIVE BARRIERS	5
074213	FORMED METAL WALL AND SOFFIT PANELS	13
076200	SHEET METAL FLASHING AND TRIM	13
079200	JOINT SEALANTS.....	8
DIVISION 08	OPENINGS	PAGES
087100	DOOR HARDWARE	14
DIVISION 09	FINISHES	PAGES
092400	PORTALAND CEMENT PLASTERING	10
096513	RESILIENT BASE AND ACCESSORIES.....	5
096519	RESILIENT TILE FLOORING	5
096816	CARPETING.....	7
087100	PAINTING.....	18
DIVISION 10	SPECIALITES	PAGES
101400	SIGNAGE	11
104415	FIRE EXTINGUISHERS AND CABINETS.....	4
DIVISION 11	EQUIPMENT	PAGES
(NOT USED)		
DIVISION 12	FURNISHINGS	PAGES
(NOT USED)		

DIVISION 13	SPECIAL CONSTRUCTION	PAGES
--------------------	-----------------------------	--------------

(NOT USED)

DIVISION 14	CONVEYING EQUIPMENT	PAGES
--------------------	----------------------------	--------------

(NOT USED)

DIVISIONS 15 - 20	PAGES
--------------------------	--------------

(NOT USED)

DIVISION 21	FIRE SUPPRESSION	PAGES
--------------------	-------------------------	--------------

(NOT USED)

DIVISION 22	PLUMBING	PAGES
--------------------	-----------------	--------------

(NOT USED)

DIVISION 23	HEATING, VENTILATING, AND AIR CONDITIONING	PAGES
--------------------	---	--------------

(NOT USED)

DIVISION 25	INTEGRATED AUTOMATION	PAGES
--------------------	------------------------------	--------------

(NOT USED)

DIVISION 26	ELECTRICAL	PAGES
--------------------	-------------------	--------------

260000	SUMMARY OF ELECTRICAL WORK.....	5
260100	GENERAL CONDITIONS FOR ELECTRICAL WORK	10
260500	BASIC ELECTRICAL MATERIALS AND METHODS	20
260526	GROUNDING	6
262213	DRY-TYPE TRANSFORMERS	8
265113	LIGHTING.....	7
269500	ELECTRICAL ACCEPTANCE TESTS	16

DIVISION 27	COMMUNICATIONS	PAGES
--------------------	-----------------------	--------------

270000	COMMUNICATIONS, PAGING, & SIGNAL CONTROL	17
270528	PATHWAYS FOR COMMUNICATIONS SYSTEMS	16
271300	COMMUNICATIONS BACKBONE CABLING	9
271500	COMMUNICATIONS HORIZONTAL CABLING DATA.....	12

DIVISION 28	ELECTRONIC SAFETY AND SECURITY	PAGES
--------------------	---------------------------------------	--------------

283100	FIRE ALARM/ EMERGENCY VOICE ALARM COMMUNICATION SYSTEM	11
--------	--	----

DIVISION 31	EARTHWORK	PAGES
310513	SOILS FOR EARTHWORK.....	2
311000	SITE CLEARING	6
312000	EARTHWORK	8
312005	TRENCHING	6
313116	TERMITE CONTROL.....	4
DIVISION 32	EXTERIOR IMPROVEMENTS	PAGES
321216	ASPHALT PAVING	7
321313	CONCRETE PAVING AND WALKS	12
321373	CONCRETE PAVING JOINT SEALANTS.....	4
321700	PAVING SPECIALTIES	7
323113	CHAIN LINK FENCES AND GATES.....	8
328400	LANDSCAPE IRRIGATION SYSTEM.....	12
329000	LANDSCAPE CONSTRUCTION.....	14
DIVISION 33	UTILITIES	PAGES
331000	WATER DISTRIBUTION.....	6
333000	SANITARY SEWERAGE	4
334000	STORM DRAINAGE FACILTIES	5
APPENDIX	TITLE	PAGES
	GEOTECHNICAL SUMMARY	3

END OF SECTION

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. Owner furnished, contractor installed products.
5. Access to site.
6. Coordination with occupants.
7. Work restrictions.
8. Specification and drawing conventions.

- B. Related Sections:

1. 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:

ELOP Relocatable Classroom – Hazelton Elementary School
535 West Jefferson Street
Stockton, CA 95206

Architect's Project Number: 23-12908
DSA Application Number: 02-122738 / File Number: 39-69

- B. Owner:

Stockton Unified School District
56 South Lincoln Street
Stockton, CA 95203

Telephone: (209) 933-7000
Contact: Justin Griffin

C. Architect:

TETER, Inc.
7535 North Palm Avenue, Suite 201
Fresno, California 93711

Telephone 559.437.0887
Contact: James E. Hickman, Jr.

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. The Project shall consist of the following items herein to include but not limited necessarily to:
 - a. (1) new 36'x40 approved relocatable classroom purchased under a separate contract between the District and Class Leasing.
 - b. Associate site work.
- B. Type of Contract: Project will be constructed under a single prime contract.

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. Concurrent Work: Owner has awarded a separate contract for the following construction operations off-site. Those operations will be conducted simultaneously with work under this Contract.
 - 1. Relocatable Classroom Building: To Class Leasing for the construction of a 36' x 40' building.

1.6 OWNER-FURNISHED CONTRACTOR-INSTALLED PRODUCTS

- A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.
- B. Owner-Furnished Products:
 - 1. Relocatable Classroom Building (constructed by Class Leasing).

1.7 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Restricted Use of Site: 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. Limits on Use of Site: Limit use of Project site to the Project area indicated and site areas allowed for Contractor's use. 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.

1.8 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.

1.9 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 to between 7:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
 - 1. Submit a written request to the Architect for work hours outside of the indicated 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. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Project site is not permitted.
- F. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.10 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements shall be complied with by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
 - 1. Where conflicts occur between Division 00 Contracting Requirements and Division 01 General Requirements, the most restrictive requirements shall apply; Architect shall make the final decision on which requirement(s) apply.
- D. Drawing and Specification Coordination:

1. Requirements for materials and products identified on Drawings are described in detail in the Specifications unless materials and products are described in detail on the Drawings.
2. Generic terms are used to identify materials and products on the Drawings.
3. Specifications establish minimum quality standards for products, materials, and installation requirements unless more stringent requirements are indicated on the Drawings; Drawings establish material and product location and quantity.
4. Where requirements for materials and products indicated on the Drawings are not specified, provide heavy duty commercial grade products and materials.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (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. Site Work Contract.
 - 2. Relocatable Building 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 "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 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 to complete the Work.
3. Site preparation; site clearing, earthwork including over excavation and backfill in preparation for construction of building pads for relocatable building.
4. Concrete foundations for relocatable building including stem wall foundations, footing excavation, formwork, reinforcing steel, anchor bolts, steel plates and termiticide.
5. Offloading from trailer and installation of relocatable building provided by Relocatable Building Manufacturer.
6. Building improvements by the Site Contractor not included in the Relocatable Building Manufacturer contract.
 - a. Exterior cement plaster system. Relocatable Building Manufacturer will deliver a "Stucco Ready" building with plywood sheathing.
 - b. Provide and install interior floor finishes as indicated in the contract documents.
 - c. Provide interior and exterior signage as indicated in the contract documents.
 - d. Remove door hardware from building provided by relocatable manufacturer and provide and install new hardware per the contract documents.
7. Site improvements include, pedestal high-low drinking fountain with bottle filler, pedestrian paving, including roadways, parking lots, fencing and landscaping.
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 the Relocatable Building Contract.
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 relocatable buildings.
- D. Electrical Work of the Site Work Contract includes, but is not limited to, the following:
1. Site electrical distribution.
 2. Site lighting.
 3. Site communications and security.
 4. Electrical service and distribution.
 5. Communication and security.
 6. Fire alarm systems and devices.

1.6 RELOCATABLE BUILDINGS CONTRACT

- A. Work of the Relocatable Building Contract includes, but is not limited to, the following:
1. Structural design and preparation of construction documents through California Division of the State Architect Approval.
 2. Plant construction of Relocatable building as indicated on the Drawings.
 3. Delivery of building to site.

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 shall be the responsibility of the Contracts as indicated on the drawings and as follows:

	Spec Section / Work Item	Site Work	Relocatable Building	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: Tools and equipment	X	X	As applicable to the work of each contract for its own work.
5.	015000 Temporary Facilities and Controls: Temporary power, water, and toilets	X		
6.	015000 Temporary Facilities and Controls: Temporary security fencing	X		
7.	024109 Selective Demolition:	X		As indicated on Drawings.

	Spec Section / Work Item	Site Work	Relocatable Building	Comments
8.	033000 Cast-in-Place Concrete: Relocatable building footings including excavation	X		As indicated on Drawings and as applicable to the work of each contract for its own work.
9.	033000 Cast-in-Place Concrete: Fence post footings including excavation	X		As indicated on Drawings.
10.	087100 Door Hardware	X		Remove hardware provided by Relocatable building and replace with specified hardware.
11.	092400 Cement Plaster	X		As indicated on Drawings.
12.	096513 Resilient Base and Accessories	X		As indicated on Drawings.
13.	096519 Resilient Tile Flooring	X		As indicated on Drawings.
14.	096816 Carpeting	X		As indicated on Drawings.
15.	099100 Painting	X		As indicated on Drawings.
16.				
17.	101400 Signage: Signs for room or space identification	X		
18.	23000 Plumbing: Under building utilities.	X		As indicated on Drawings.
19.	Division 26 Electrical: Power distribution to and connection of power relocatable buildings.	X		As indicated on Drawings.
20.	Division 28 Fire Alarm: Provide and install fire alarm devices and wiring within relocatable building.	X		As indicated on Drawings.
21.	311100 Site Clearing: Site Clearing	X		As indicated on Drawings.
22.	312000 Earthwork: Over excavation, fill, and compaction in the area of relocatable building.	X		As indicated on Drawings.
23.	312000 Earthwork: Excavation for relocatable building footings, removal of excess soil excavated from footings, finish grading of soil in vicinity of relocatable footings	X		As indicated on Drawings and as applicable to the work of each contract for its own work.
24.	321313 Concrete Paving and Walks: Concrete paving and walks	X		As indicated on Drawings.
25.	323113 Chain Link Fences and Gates: C.L. fences and gates.	X		As indicated on Drawings.

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 Authority having Jurisdiction (AHJ) by the project Architect and shall be approved by the AHJ 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
ARCHITECTS ENGINEERS CONNECTED

ELECTRONIC DATA FILE DISTRIBUTION WAIVER OF LIABILITY

TETER

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**. 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 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 or addenda, and shall be approved by DSA prior to fabrication and installation (CAC, Section 4-338 (c), IR A-6).
 - 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."
 - 3. Construction change Documents (CAC, Section 4-338©) must be signed by all the following: Architect/Engineer of record, Structural Engineer when applicable, Delegated professional engineer when applicable, DSA.

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.

1.8 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 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

(Substitution Request Form included on the following page)



Substitution Request Form

Corporate Headquarters
7535 N. Palm Ave. #201
Fresno, CA 93711

559.437.0887 T
559.438.7554 F
teterae.com

FOR: **ELOP Relocatable – Hazelton Elementary School**

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

SECTION	PARAGRAPH	SPECIFIED ITEM
<hr/>		

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:

Remarks:

For Use by Design Consultant

Accepted

Accepted as Noted

Not Accepted

Received Too Late

By:

Date:

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 that are affecting the DSA Approved Construction Documents shall submit applicable DSA CCD documentation and/or addendum 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) Interpretive Regulation IR A-30 "DSA Hourly Fee Services" latest edition (Document is available on DSA's website under "Publications;" Interpretive Regulations (IRs); A- Administrative; IR-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)



Request for Information

Corporate Headquarters
7535 N. Palm Ave. #201
Fresno, CA 93711

559.437.0887 T
559.438.7554 F
teterae.com

Project:
ELOP Relocatable – Hazelton ES
TETER Project No. 23-12908
535 W. Jefferson St.
Stockton, CA, 95206

Client Project No.

DSA File No. 36-69
DSA Appl No. 02-122738

Date:

Request for Information No. _____

☐ Deviation from Contract Docs
☐ Correction of Non-Compliant Work

From:
Name
Company Name

To:
Dylan Seaton
Project Manager
TETER
7535 N. Palm Ave. #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.

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, Project Inspector, 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, Project Inspector, 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, Project Inspector, 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 inspecting 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, Project Inspector, 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, Project Inspector, 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, Project Inspector, 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, area separations and interim milestones.
 - 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. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 3. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 4. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 5. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Submittals.
 - b. Purchases.
 - c. Fabrication.
 - d. Sample testing.
 - e. Deliveries.
 - f. Installation.
 - g. Tests and inspections.
 - h. Adjusting.
 - i. Curing.
 - j. Startup and placement into final use and operation.
 7. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Permanent space enclosure.
 - c. Completion of electrical installation.
 - d. 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. 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.
- B. 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.
- C. 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.
- D. 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.

- E. 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, Project Inspector, 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.
- B. Related Sections:
 - 1. Division 31 Section "Site Clearing" for photographic documentation before site clearing operations commence.

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. Owner's Project Inspector:

- a. A Project 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. The Project Inspector's duties are 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 Project Inspector. The Project Inspector shall have free access to any or all parts of the work at any time. The Contractor shall furnish the Project Inspector reasonable facilities for obtaining such information as may be necessary to keep the Project Inspector 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.

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 California Administrative Code, Section 4-336. 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.
 - 1. 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.

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, 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, 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, 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.

1.12 OBSERVATION AND INSPECTION OF CONSTRUCTION.

- A. Observation by architect or registered engineer.
 - 1. The Act requires that the observation of the work of construction, reconstruction, rehabilitation, alteration or addition shall be under the general responsible charge of an architect, structural engineer, or under certain conditions a professional engineer registered in that branch of engineering applicable to the work. (See Section 4-316.

The responsible geotechnical engineer, or his or her qualified representative, shall perform all testing and special inspection of all earth materials, the placement and compaction of engineered fills, and the geotechnical aspects of foundations, retaining walls and foundation anchors. The responsible geotechnical engineer shall submit verified reports in accordance with Section 4-336 and Title 24, Part 2, Section 1704A.7.1.

1.13 INSPECTION BY A PROJECT INSPECTOR.

A. The school board must provide for and require competent, adequate and continuous inspection by an inspector satisfactory to the architect or registered engineer in general responsible charge of observation of the work of construction; to any registered structural engineer delegated responsibility for a portion of the work and to DSA.

1. The cost of project inspection shall be paid for by the school board. An inspector shall not have any current employment relationship with any entity that is a contracting party for the construction or any entity providing any services for the school district except for services directly related to project inspection.
2. Project inspectors are prohibited from any activities involving the actual performance of construction, or the scheduling, coordination or supervision of construction contractors for the project.
3. For every project there shall be a project inspector who shall have personal knowledge as defined in Sections 17309 and 81141 of the Education Code of all work done on the project or its parts as defined in Section 4-316. No work shall be carried on except under the inspection of an inspector approved by DSA. On large projects adequate inspection may require the employment of one or more approved assistant inspectors in accordance with Section 4-333(d). The employment of special inspectors or assistant inspectors shall not be construed as relieving the project inspector of his or her duties and responsibilities under Sections 17309 and 81141 of the Education Code and Sections 4-336 and 4-342 of these regulations.
4. The project inspector shall be capable of performing all essential functions of the job.
5. The project inspector and any assistant inspector must be approved by DSA for each individual project. Prior to being eligible for approval, any project inspector or any assistant inspector shall establish, to the satisfaction of DSA that he or she:
 - a. is appropriately certified by DSA, per Section 4-333.1; and
 - b. has adequate knowledge and experience to perform the required duties for the project. He or she shall have at least three years of experience in inspection or construction work on building projects of a type similar to the project. For newly certified inspectors without prior DSA project inspection experience, attendance of DSA-specified training is required; and
 - c. will provide sufficient time on the project to fulfill all inspection responsibilities required by these regulations.
6. An approved project inspector may be replaced in accordance with the process outlined in Section 4-341(d). The school district shall ensure that a replacement inspector is provided prior to continuation of construction work. DSA may

- withhold approval of the replacement inspector until a verified report by the previous project inspector is submitted in accordance with Section 4-336(c)5.
7. DSA may withdraw the inspector's approval for the project due to failure of project inspector to comply with the requirements contained in Section 4-342(b). DSA shall communicate the withdrawal of the project inspector's approval in writing to the school district and the architect or registered engineer in general responsible charge. The school district shall ensure that a replacement inspector is provided prior to continuation of construction work.
 8. The project inspector may perform special inspections if the project inspector has been specially approved by DSA for such purpose and has the time available to complete the special inspections in addition to project inspection work.
 9. The detailed inspection of all work, as specified in Section 4-335(f), is the responsibility of the project inspector when a special inspector is not provided.

1.14 SPECIAL INSPECTION.

1. Special inspection by qualified inspectors shall be in accordance with Title 24, Part 2, Chapter 17A. DSA may require special inspectors for types of construction in addition to those listed in Chapter 17A, Title 24, Part 2 if found necessary because of the special use of materials or methods of construction.
2. Special inspections and tests. Where application is made to the building official for construction as specified in Section 105, the owner shall employ one or more approved agencies to provide special inspections and tests during construction on the types of work specified in Section 1705A and identify the approved agencies to the building official. These special inspections and tests are in addition to the inspections by the building official that are identified in Section 110.

1.15 ASSISTANT INSPECTORS.

- A. Assistant inspectors are approved by DSA to assist the project inspector with the inspection of one or more aspects of the construction. Assistant inspectors must work under the supervision of a Class 1 or 2 certified project inspector.
 1. On large projects DSA may require the employment of assistant inspectors when the project inspector is not able to provide continuous inspection of all aspects of the construction in a timely manner. When assistant inspectors are required by DSA the project inspector shall remain on-site providing supervision of all assistants during all construction.
 2. All assistant inspectors must be approved by DSA prior to performing any inspection work in accordance with Section 4-341(d). Prior to being approved by DSA as an assistant inspector the individual must satisfy all of the following requirements:
 - a. Be certified as a Class 1, Class 2, Class 3 or Class 4 inspector in accordance with Section 4-333.1.
 - b. Must possess adequate experience for the type of construction that the assistant will be assigned to inspect.
 - c. Document at least three years of experience in the types of construction that the assistant will inspect. Experience must be obtained in construction or inspection of buildings similar to the buildings for which the individual is applying.

3. The assistant inspector shall establish, to the satisfaction of DSA that he or she meets all of the requirements established in Section 4-333(b)5.
4. Failure of the assistant inspector to perform any of the duties specified in these regulations may be cause for DSA to take action as outlined in Section 4-342(d).

1.16 BUILDING MATERIALS

- A. New building materials, equipment, appliances, systems or methods of construction not provided for in this code, and any material of questioned suitability proposed for use in the construction of a building or structure, shall be subjected to the tests prescribed in this chapter and in the approved rules to determine character, quality and limitations of use.

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.
 - 1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.
- 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 indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- 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. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
 - 2. ICC - International Code Council; www.iccsafe.org.
 - 3. 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. DSA; Division of the State Architect.
7. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
8. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservation.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 of Work" 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.
 - 2. Site work contractor is responsible for dust control on site during the project duration. Including but not limited to: providing watering truck, driver and water for the truck.

- 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 CEC.
- 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.
- D. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

TEMPORARY STORAGE FACILITIES

- E. 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.

2.2 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. Accessibility Requirements: 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).

2.3 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.
- C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 - 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 - 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

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. Temporary 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. 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.
- F. 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.
- G. 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. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted.
- C. 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.
- D. Parking: Parking areas for construction personnel shall be at location(s) as directed by Owner.
- E. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- F. 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.
- G. 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.
- H. 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.
- I. 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.
 - J. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."
 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving."

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 of Work."
- 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."

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. Site Safety Plan: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of the Site Safety Plan.

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. Responsibility for Fire Protection (CFC 3303)
 - 1. Program Development and Maintenance: The Contractor shall be responsible for the development, implementation and maintenance of an approved written site safety plan establishing a fire prevention program at the project site applicable throughout all phases of the construction, repair, alteration, or demolition work. The plan shall address the requirements of CFC Section 3303.1

2. **Site Safety Director:** The Contractor shall designate a person to be the Site Safety Director. The Site Safety Director shall be responsible for ensuring compliance with the site safety plan. The Site Safety Director 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 Site Safety Director shall be responsible for the guard service.
3. **Daily Fire Safety Inspection:** The Site Safety Inspector shall be responsible for completion of a daily fire safety inspection at the project site. Each day, all building and outdoor areas shall be inspected to ensure compliance with the inspection list in California Fire Code Section 3303.3. The results of each inspection shall be documented and maintained on-site until a certificate of occupancy has been issued. Documentation shall be immediately available on-site for presentation to the fire code official upon request.
 - a. **Qualifications:** Site Safety Directors shall acquire training specific to their roles and responsibilities. Upon request, the training and qualifications of the Site Safety Director shall be submitted to the fire code official for approval.
4. **Training:** Training of fire watch and other responsible personnel in the use of fire protection equipment shall be the responsibility of the Site Safety Director. Records of training shall be kept and made a part of the written plan for the Site Safety Plan.
5. **Fire Protection Devices:** The Site Safety Director shall ensure that all fire protection equipment is maintained and serviced in accordance with the California Fire Code. Fire protection equipment shall be inspected in accordance with the fire protection program.
6. **Hot Work Operations:** The Site Safety Director shall ensure hot work operations and permit procedures are in accordance with the California Fire Code, Chapter 35.
7. **Impairment of Fire Protection Systems:** The Site Safety Director shall ensure impairments to any fire protection system are in accordance with 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:** 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.

C. Temporary Heating Equipment (CFC 3304):

1. Listing: Temporary heating devices shall be listed and labeled. Installation, maintenance and use of temporary heating devices shall be in accordance with the terms of the listing and the manufacturer's directions.
2. LP-Gas Heaters: Fuel supplies for liquified petroleum gas fired heaters shall comply with 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.

D. Precautions Against Fire (CFC 3305):

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/m² when tested in accordance with ASTM E 1354 at an incident heat flux of 50 kW/m² 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 or the Site Safety Plan established in accordance with California Fire Code Section 3303.1, a fire watch shall be provided for building demolition and for building construction.
 - a. Fire Watch During Construction: A fire watch shall be provided during non-working hours for new construction that exceeds 40 feet in height above the lowest adjacent grade at any point along the building perimeter, for new multi-story construction with aggregate area exceeding 50,000 sf per story or as required by the fire code official.

b. Fire Watch Personnel:

- 1) Duties: The primary duty of fire watch personnel shall be to perform constant patrols and watch for the occurrence of fire. The combination of fire watch duties and site security duties is acceptable.
- 2) Training: Personnel shall be trained to serve as an on-site fire watch. Training shall include the use of portable fire extinguishers. Fire extinguishers and fire reporting shall be in accordance with California Fire Code, Section 3310.
- 3) Means of Notification: Fire watch personnel shall be provided with not fewer than one approved means for notifying the fire department.

c. Fire Watch Location: The fire watch shall include areas specified by the Site Safety Plan established in accordance with California Fire Code Section 3303.

d. Fire Watch Records: Fire watch personnel shall keep a record of all time periods of duty, including the log entry for each time the site was patrolled and each time a structure was entered and inspected. Records 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.

E. Flammable and Combustible Liquids (CFC 3306):

1. Storage of Flammable and Combustible Liquids: Storage of flammable and combustible liquids shall be in accordance with 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 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 with 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.

F. Flammable Gases (CFC 3307):

1. Storage and Handling: Storage and handling of flammable gasses shall comply with 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.

G. Explosive Materials (CFC 3308): Explosive materials shall not be allowed.

H. Portable Generators (CFC 3309): Portable generators used at construction and demolitions sites shall comply with California Fire Code Section 1204

I. Fire Reporting (CFC 3310)

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.

J. Access for Fire Fighting (CFC 3311):

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 California Fire Code Chapter 5 "Fire Service Features."

K. Means of Egress (CFC 3312):

1. Stairways Required: Where building construction exceeds 40 feet in height above the lowest level of fire department vehicle access, a temporary or permanent stairway shall be provided.
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.
3. Combustible Materials Storage: Combustible materials associated with construction, demolition, remodeling or alterations to an occupied structure shall not be stored in exits, enclosures for stairs, or exit access corridors serving an occupant load of 30 or more.

L. Water Supply for Fire Protection (CFC 3313):

1. When Required: An approved water supply for fire protection, either temporary or permanent, shall be made available as soon as combustible building materials arrive on the site, on concealment of vertical combustible construction, and on installation of a standpipe system in buildings under construction, in accordance with California Fire Code Section 3313.2 through 3313.5.

M. Standpipes (CFC 3314):

1. Where Required: In buildings required to have standpipes by California Fire Code Section 905.3.1, not less than one standpipe shall be provided for use during construction. Such standpipes shall be installed prior to construction exceeding 40 feet in height above the lowest level of fire department vehicle access. Such standpipes shall be provided with fire department hose connections at locations adjacent to stairways complying with California Fire Code Section 3312.1. As construction progresses, such standpipes shall be extended to within one floor of the highest point of construction having secured decking or flooring.
2. Buildings Being Demolished: Where a building is being demolished and a standpipe is existing within such a building, such standpipe shall be maintained in an operable condition so as to be available for use by the fire department. Such standpipe shall be demolished with the building but shall not be demolished more than one floor below the floor being demolished.
3. Detailed Requirements: Standpipes shall be installed in accordance with the provisions of California Fire Code Section 905.
 - a. Standpipes shall be either temporary or permanent in nature, and with or without a water supply, provided that such standpipes comply with the requirements of California Fire Code Section 905 as to capacity, outlets and materials.

N. Automatic Sprinkler System (CFC 3315):

1. Completion Before Occupancy: In buildings where an automatic sprinkler system is required by the California Fire Code or California Building Code, it shall be unlawful to occupy any portion of a building or structure until the automatic sprinkler system installation has been tested and approved, except as provided in California Fire Code Section 105.3.4.
2. Operation of Valves: In buildings where an automatic sprinkler system is provided, operation of sprinkler control valves shall be allowed only by properly authorized personnel and shall be accompanied by notification of duly designated parties. Where the sprinkler protection is being regularly turned off and on to facilitate connection of newly completed segments, the sprinkler control valves shall be checked at the end of each work period to ascertain that protection is in service.

O. Portable Fire Extinguishers (CFC 3316):

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.

P. Motorized Construction Equipment (CFC 3317):

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.

Q. Safeguarding Roofing Operations (CFC 3318):

1. General: Roofing operations utilizing heat producing systems or other ignition sources shall be conducted in accordance with California Fire Code Sections 3318.2 and 3318.3, 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. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
 2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."
- F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.
- 1.4 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.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
3. See individual identification Sections in Division 26 for additional equipment identification requirements.

1.5 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

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. Provide a secure location and enclosure at Project site for storage of materials and equipment.
 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 and with adequate protection from wind.

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 and issued in the name of the Owner or endorsed by manufacturer to 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. Submittal Time: 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 be considered.
 - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
2. 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 be considered.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
3. 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.
4. Basis-of-Design Products: Where Specifications indicate a manufacturer and product indicated by the phrase "Basis of Design," provide the product indicated.
 - a. Where specifications list manufacturers of comparable products subject to compliance with requirements, comparable products complying with properties and characteristics based on the named product may be provided by one of the other named manufacturers.
 - b. Where specifications do not list additional manufacturers, other products may be considered for substitution subject to compliance with requirements in Division 01 Section 012500 "Substitution Procedures" and compliance with properties and characteristics based on the named 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 Matching Specification: Where Specifications include the phrase "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 Section 012500 "Substitution Procedures" for proposal of product.
- E. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a 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.
- F. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.
 - 1. Select products for which sustainable design documentation submittals are available from manufacturer.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable products when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
 - 1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
 - 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 - 3. Evidence that proposed product provides specified warranty.
 - 4. Samples, if requested.

- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."
 - 1. Form of Approval of Submittal: As specified in Division 01 Section 013300 "Submittal Procedures."
 - 2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

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. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting, patching and repairing.
 - 5. Coordination of Owner-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
 - 9. Correction and/or Repair of the Work.
- B. Related Requirements:
 - 1. Division 01 Section "Summary of Work" for limits on use of Project site.
 - 2. Division 01 Section "Submittal Procedures" for submitting surveys.
 - 3. Division 02 Section "Selective Demolition" for demolition and removal of selected site elements.

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 SUBMITTALS

- A. Surveys: Submit survey of accessible route improvements stamped and signed by land surveyor or professional engineer certifying that elevations and slopes of improvements comply with disabled access requirements.
 - 1. Survey shall be a separate submittal and shall also be included in the Project Record Documents.

1.5 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-suppression systems.
 - c. Communication systems.
 - d. Fire-detection and alarm systems.
 - e. Electrical wiring systems.
 - f. 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. Equipment supports.
 - d. 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 through 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.
- B. Survey of Accessible Routes: On completion of site improvements, prepare a topographic survey of accessible routes showing dimensions, locations, and elevations of accessible features in order to certify compliance with requirements for disabled access. Survey shall be limited to site features included in the Work of the Project.
- C. Certified Survey: On completion of site drainage features, foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

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 AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in 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. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching 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.
- 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 CORRECTION AND/OR REPAIR OF THE WORK

- A. 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 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.

3.8 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.

- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.9 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.

3.10 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."

3.11 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.

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. Recycling nonhazardous construction and demolition waste.
 - 2. Disposing of nonhazardous construction and demolition waste.
- B. Related Requirements:
 - 1. Division 31 Section "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

- A. CGBSC: California Green Building Standards Code.
- B. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- C. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- D. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- E. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- F. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- G. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and 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. Use separate forms for construction waste and demolition waste. 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 REGULATORY REQUIREMENTS

- A. Construction Waste Management: Refer to CGBSC Section 5.408.1 Construction Waste Management. Recycle and/or salvage for reuse a minimum of 65 percent of the non-hazardous construction and demolition waste in accordance with CGBSC Section 5.408.1.1, 5.408.1.2, or 5.408.1.3 (Below) or meet a local construction and demolition waste management ordinance, whichever is more stringent:
 - 1. GBSC Section 5.408.1.1, Construction Waste Management Plan: Where a local jurisdiction does not have a construction and demolition waste management ordinance that is more stringent, provide Waste Management Plan that:
 - a. Identifies the construction and demolition 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 and demolition waste materials will be sorted on-site (source separated) or bulk mixed (single stream).
 - c. Identifies diversion facilities where construction and demolition waste material collected will be taken.
 - d. Specifies the amount of construction and demolition waste materials diverted shall be calculated by weight or volume, but not by both.

2. GBSC Section 5.408.1.2, Waste Management Company: Utilize a waste management company that can provide verifiable documentation that the percentage of construction and demolition 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. GBSC Section 5.408.1.3, Waste Stream Reduction Alternative: 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.
- B. Documentation, CGBSC Section 5.408.1.4: Documentation shall be provided to the enforcing agency which demonstrates compliance with Sections 5.408.1.1. through 5.408.1.3. The Waste management plan shall be updated as necessary and shall be accessible during construction for examination 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. 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.
- C. 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 DEMOLITION WASTE

- A. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

3.4 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.
 - a. Comply with requirements in Division 32 Sections as applicable to planting for use of clean sawdust as organic mulch.

3.5 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. Substantial Completion procedures.
 - 2. Final Completion procedures.
 - 3. Final cleaning.
 - 4. Repair of the Work.
- B. Related Requirements:
 - 1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
 - 2. Division 01 Section "Execution" for repair of the Work.
 - 3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance documentation requirements.
 - 4. Division 01 Section "Project Record Drawings" for preparing and submitting Project Record Drawings.
 - 5. Division 01 Section "Warranties" for submitting final warranty information.
 - 6. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
 - 7. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.4 SUBMITTALS

- A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- B. Contractor's List of Incomplete Items: Final submittal at Final Completion.

1.5 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 submittals 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 submittals 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 testing, adjusting, and balancing 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 utility services.
 - 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. Following inspection, 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.

1.6 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
 2. List of Incomplete Items: Submit copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect; copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit Final Completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS

- 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. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
 - h. Vacuum and mop concrete.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - j. 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.
 - k. Remove labels that are not permanent.
 - l. Wipe surfaces of mechanical, electrical, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - q. 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 required by Division 01 Section 017300 "Execution" 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.

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. 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. Warranty Submittal: Submit (2) paper copies and one electronic copy of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer.
 - 1. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 2. Provide additional copies of each warranty in operation and maintenance manuals.
- C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 - 1. Submit by email to Architect.

D. Warranties in Paper Form:

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

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 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 INFORMATIONAL SUBMITTALS

- A. Training materials in addition to Operation and Maintenance manuals required in Division 01 Section "Operation and Maintenance Data."
- B. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Schedule shall be coordinated and finalized with the Owner.
- C. Qualification Data: For instructor.
- D. Attendance Record: For each training module, submit list of participants and length of instruction time.
- E. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

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's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved operation and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.6 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.

1.7 PREPARATION

- A. Assemble educational materials necessary for instruction and training. Assemble training manuals organized in coordination with requirements in Division 01 Section "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

1.8 INSTRUCTION

- A. Develop instruction program and prepare training modules; coordinate instructors, and coordinate with Owner for the number of participants, instruction times, and locations.
- B. Engage qualified instructors to 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.
- C. 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.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, a written and a demonstration performance-based test.
- F. Cleanup: Collect used and leftover educational materials and deliver to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

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. 1, DSA Form 403-C "CALGREEN CODE SUBMITTAL CHECKLIST."

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 Form 403-C "CALGREEN CODE SUBMITTAL CHECKLIST."
 - 1. DSA Form 403-C completed by Architect and included in the Appendix of this Project Manual; design and construction to comply with requirements indicated.

- B. California Code of Regulations, Title 24, Part 11, California Green Building Standards Code (CGBSC). Requirements include but are not limited to the following:
1. 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:
 - a. Construction Waste Management Plan.
 - b. Recycling, reuse, and/or salvaging non-hazardous construction waste.
 2. Environmental Quality/Pollutant Control: Comply with requirements of the 2022 CGBSC, Sections as follows:
 - a. 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.
 - b. 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):
 - 1) Adhesives: 2022 CGBSC Table 5.504.4.1 Adhesive VOC Limit:
 - a) Indoor Carpet Adhesives: 50 g/L.
 - b) Carpet Pad Adhesives: 50 g/L.
 - c) Rubber Floor Adhesives: 60 g/L.
 - d) Wood Flooring Adhesive: 100 g/L.
 - e) Subfloor Adhesives: 50 g/L.
 - f) Ceramic Tile Adhesives: 65 g/L.
 - g) VCT and Asphalt Tile Adhesives: 50 g/L.
 - h) Gypsum Board and Panel Adhesives: 50 g/L.
 - i) Cove Base Adhesives: 50 g/L.
 - j) Multipurpose Construction Adhesives: 70 g/L.
 - k) Structural Glazing Adhesives: 100 g/L.
 - l) Single-Ply Roof Membrane Adhesive: 250 g/L.
 - m) Other Adhesives not specifically listed: 50 g/L.
 - n) PVC Welding Compounds: 510 g/L.
 - o) CPVC Welding Compounds: 490 g/L.
 - p) ABS Welding Compounds: 325 g/L.
 - q) Plastic Cement Welding Compounds: 250 g/L.
 - r) Adhesive Primer for Plastic: 550 g/L.
 - s) Contact Adhesive: 80 g/L.
 - t) 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.
 - u) Structural Wood Member Adhesive: 140 g/L.

- v) Top and Trim Adhesive: 250 g/L.
 - w) Metal-to-Metal Adhesives: 30 g/L.
 - x) Plastic Foam Adhesives: 50 g/L.
 - y) Adhesives for Porous Materials (Except Wood): 50 g/L.
 - z) Wood Glues: 30 g/L.
 - aa) Fiberglass Adhesives: 80 g/L.
- 2) Sealants: 2022 CGBSC Table 5.504.4.2, Sealant VOC Limit:
- a) Architectural Sealants: 250 g/L.
 - b) Nonmembrane Roof Sealants: 300 g/L.
 - c) Paving Sealants: 250 g/L.
 - d) Single-Ply Roof Membrane Sealants: 450 g/L.
 - e) Other Sealants: 420 g/L.
 - f) Sealant Primers for Nonporous Substrates: 250 g/L.
 - g) Sealant Primers for Porous Substrates: 775 g/L.
 - h) Modified Bituminous Sealant Primers: 500 g/L.
 - i) Other Sealant Primers: 750 g/L.
- c. 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):
- 1) Paints and Coatings: 2022 CGBSC Table 5.504.4.3, VOC Content Limits for Architectural Coatings:
- a) Flat Paints and Coatings: VOC not more than 50 g/L.
 - b) Nonflat Paints and Coatings: VOC not more than 100 g/L.
 - c) Nonflat High-Gloss Paints and Coatings: VOC not more than 150 g/L.
 - d) Dry-Fog Coatings: VOC not more than 150 g/L.
 - e) Floor Coatings: VOC not more than 100 g/L.
 - f) Pretreatment Wash Primers: VOC not more than 420 g/L.
 - g) Primers, Sealers, and Undercoaters: VOC not more than 100 g/L.
 - h) Rust Preventative Coatings Applied to Ferrous Metals: VOC not more than 250 g/L.
 - i) Shellacs, Clear: VOC not more than 730 g/L.
 - j) Shellacs, Pigmented: VOC not more than 550 g/L.
 - k) Stains: VOC not more than 250 g/L.
 - l) Clear Wood Finishes, Varnishes: VOC not more than 275 g/L.
 - m) Clear Wood Finishes, Lacquers: VOC not more than 275 g/L.
 - n) Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.

- d. 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.
- 3. Carpet Systems: Comply with requirements of CGBSC, Section 5.504.4.4.
 - a. 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).
 - 1) See California Department of Public Health's website for certification programs and testing labs.
 - b. 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)
- 4. 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.
- 5. Resilient Flooring Systems: Comply with requirements CGBSC, Section 5.504.4.6.
 - a. 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).
 - b. 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)

6. Thermal Insulation: Comply with requirements of CGBSC, Section 5.504.4.7.
 - a. All thermal insulation installed in buildings shall comply with the requirements of the California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Version 1.2, January 2017 (Emissions testing method for California Specification 01350).
 - 1) See California Department of Public Health's website for certification programs and testing labs.
7. Acoustical Ceilings and Wall Panels: Comply with requirements of CGBSC, Section 5.504.4.8.
 - a. Acoustical ceiling and wall panels installed in building interiors shall comply with the requirements of the California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Version 1.2, January 2017 (Emissions testing method for California Specification 01350).
 - 1) See California Department of Public Health's website for certification programs and testing labs.
8. 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.
 - a. Exception: Existing mechanical equipment.
 - b. Labeling: Installed filters shall be clearly labeled by the manufacturer indicating the MERV rating.
9. 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.
 - a. Exception:
 - 1) 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.

- 2) Exception: For public schools and community colleges, the requirements of CGBSC Section 5.507.4, and all subsections, apply only to new construction.
10. 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.

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 site elements.
- 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, and for protection of existing construction.
 - 4. Division 01 Section "Construction Waste Management and Disposal" for salvaging, recycling, and disposing of nonhazardous demolition and construction waste.
 - 5. Division 31 Section "Site Clearing" for removing above and below-grade site improvements not part of selective demolition.

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.
- C. Predemolition Photographs: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit before Work begins.

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. 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. Survey of Existing Conditions: Record existing conditions that affect the Work by use of preconstruction photographs. Comply with requirements specified in Division 01 Section "Photographic Documentation."
- C. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- D. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

- E. Hazardous Materials: It is expected that hazardous materials will not be encountered in the Work.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.
- F. 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.
- G. 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. Protection of Existing Construction: Protect existing construction to remain with temporary protections and construction. Do not remove existing construction unless otherwise indicated.
- D. Remove temporary barricades and protections where hazards no longer exist.

3.4 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. 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: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- B. 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.
- C. Reinforcing Steel: Where ends of reinforcing steel are exposed following cutting and removal of concrete and/or masonry, paint exposed ends of cut reinforcing steel with not less than two coats of zinc rich primer.

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 26 Sections as applicable to Electrical items embedded in concrete.
 - 3. Division 31 Sections as applicable to earthwork.
 - 4. Division 32 Sections as applicable to concrete paving and site concrete work.

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. Fiber reinforcement.
 - 6. Waterstops.
 - 7. Curing compounds.
 - 8. Floor and slab treatments.
 - 9. Bonding agents.
 - 10. Adhesives.
 - 11. Semirigid joint filler.
 - 12. Joint-filler strips.
 - 13. 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 318-19, "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. 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. Vapor-retarder installation.
 - d. Steel reinforcement installation.
 - e. Anchor rod and anchorage device installation tolerances.
 - f. Cold and hot weather concreting procedures.
 - g. Concrete finishes and finishing.
 - h. Curing procedures.
 - i. Forms and form-removal limitations.
 - j. Shoring and reshoring procedures.
 - k. Methods for achieving specified floor and slab flatness and levelness.

- l. Floor and slab flatness and levelness measurements.
- m. Concrete repair procedures.
- n. Concrete protection.
- o. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
- p. Protection of field cured field test cylinders.

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, topical concrete vapor control barrier, 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 Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
- F. 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 (80 ksi minimum tensile strength, 1.1 minimum ratio of actual tensile strength to actual yield strength), 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. Plain-Steel Welded Wire Reinforcement: ASTM A1064, plain, fabricated from as-drawn steel wire into flat sheets.
- E. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (80 ksi minimum tensile strength, 1.1 minimum ratio of actual tensile strength to actual yield strength), plain-steel bars, cut true to length with ends square and free of burrs.
- F. 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.
- G. 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. Source Limitations:

- 1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
- 2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
- 3. Obtain aggregate from single source.
- 4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Material:

- 1. Portland Cement: ASTM C 150, Type II, gray.
- 2. Portland Cement: ASTM C 150, Type V, gray.
 - a. Use 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.
- 3. 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.
- 4. Blended Hydraulic Cement: ASTM C595/C595M, Type IL, portland-limestone cement.

C. 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 alkalis 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.

D. 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. Calcium chloride, thiocyanates or admixtures containing more than 0.05% chloride ions are not permitted.
- C. 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 VAPOR RETARDERS

- A. Sheet Vapor Retarder: As specified in Division 07 Section "Underslab Vapor Retarder," ASTM E 1745, Class A, 15 mil thickness minimum.

2.7 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:
 - 1. Type V, load bearing, for bonding freshly mixed concrete to hardened concrete.

2.8 REPAIR MATERIALS

- A. 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.

2.9 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. 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.
- C. 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.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Proportion normal-weight concrete mixture as indicated on Drawings for strength, slump, water/cement ratio, and maximum aggregate size.

2.11 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 VAPOR RETARDERS

- A. Vapor retarders shall be installed in accordance with the requirements of Division 07 Section "Underslab Vapor Retarder."

3.5 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.
 - 1. Coordinate installation of steel reinforcement with installation of vapor barrier specified in Division 07 Section "Underslab Vapor Retarder."
 - 2. Do not cut or puncture vapor retarder; if cut or damaged, vapor barrier shall be repaired in accordance with Division 07 Section "Below Grade Vapor Retarder."
- 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.

3.6 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.

3.7 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.

3.8 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.

3.9 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. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. 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.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. 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 be exposed and sealed concrete	Troweled Finish
2.	Ramped exposed concrete	Medium Broom Finish
3.	Surfaces to receive waterproof membranes	Floated Finish

- C. 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.	Other areas not specified	Overall: Local:	25 17	20 15

- D. 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 indicated on the Drawings.
- E. 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.

3.11 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.

3.12 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.

3.13 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 of 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: 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. The approved DSA -103 indicates waiver of batch plant inspection.

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 is 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 055000
METAL FABRICATIONS

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. Steel framing and supports for applications where framing and supports are not specified in other Sections.
- 2. Steel weld plates and angles for casting into concrete not specified in other Sections.
- 3. Guards and hand railings.

- B. Related Sections:

- 1. Division 03 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.

1.3 SUBMITTALS

- A. Product Data: For the following:

- 1. Fasteners.
- 2. Shop primers.
- 3. Shrinkage-resisting grout.
- 4. Slotted channel framing.

- B. Shop Drawings: For metal fabrications, include plans, elevations, sections, and details of metal fabrications and their connections; show anchorage and accessory items. Show fabrication and installation details for metal fabrications.

- C. Welding certificates.

- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

- E. Research Reports: For post-installed anchors.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.3, "Structural Welding Code--Sheet Steel."

1.5 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of in-place construction contiguous with metal fabrications 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 dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate contiguous construction to ensure that actual dimensions correspond to established dimensions.

1.6 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support metal fabrications temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

- a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
- b. Infill load and other loads need not be assumed to act concurrently.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

- 1. Temperature Change: 120 deg. F ambient; 180 deg F, material surfaces.

2.2 METAL PRODUCTS

A. Identification of Structural Steel: The fabricator shall maintain the identity of steel used for structural purposes and shall maintain suitable procedures and records attesting that the specified grade has been furnished, in compliance with AISC 360 and 2022 CBC Section 2202A.1.

- 1. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.

- a. Mill markings may be covered by shop priming provided the fabricator provides identification mark over the primer that can be traced through documentation.

B. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Steel Tubing: ASTM A 500, cold-formed steel tubing.

E. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

- 1. Provide galvanized finish for exterior installations where indicated.

F. Slotted Steel Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

- 1. Basis of Design: Unistrut Corporation; P1000 Channel Framing System.
- 2. Size of Channels: 1-5/8 by 1-5/8 inches.
- 3. Channel Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33, with G90 coating; 0.108-inch (12 gage) nominal thickness.
- 4. Material for Fittings: Steel conforming to ASTM A 575, A 576, A 36, or A 635; with finish matching channels.

G. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coating, structural steel, Grade 33, unless another grade is required by design loads.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.
- D. Anchor Bolts and Unheaded Rods: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Post Installed Concrete Anchors: Fabricated from corrosion-resistant materials; manufacturer, size, and type as indicated on Drawings.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Division 09 Section "Painting."
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- E. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- F. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.5 FABRICATION, GENERAL

- A. Maintain identification markings of steel used for structural purposes until steel has been erected. Mill markings may be covered by shop priming provided the fabricator provides identification mark over the primer that can be traced through documentation.

- B. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- F. Weld connections, corners, and seams continuously, unless otherwise indicated, to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
 - 5. Cope ends of pipe or round tubing at connections to provide close fit.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
- H. Fabricate seams and connections that will be exposed to weather in a manner that excludes water. Provide weep holes for drainage where water may accumulate.
- I. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- J. Provide for anchorage of type indicated on Drawings; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as indicated on the Drawings and as needed to complete the Work.

- B. Fabricate miscellaneous framing and supports from steel shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by miscellaneous framing and supports.
 - 1. Drill, cut, and tap miscellaneous framing and supports to field bolted connections and to receive hardware, hangers, and similar items.
- C. Prime miscellaneous framing and supports used at interior applications.
- D. Galvanize miscellaneous framing and supports used for exterior applications or where indicated.

2.7 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.8 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize and prime exterior miscellaneous steel trim.

2.9 RAILINGS AND GUARDS

- A. General: Fabricate railings and guards to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.
- B. Regulatory Requirements: Handrails, guards, and infill rails or panels shall comply with the California Building Code Sections 1014, 1015, and 11B-505.
- C. Handrails:
 - 1. Material: Schedule 40 steel pipe or round steel tubing of equivalent diameter and wall thickness of sizes indicated.
 - 2. Diameter: As indicated on Drawings, 1-1/4 inch minimum, 2 inch maximum outside diameter.

3. Mounting Height: Design height of 36 inches (Code range of 34 inches minimum, 38 inches maximum), height measured vertically above the walking surface of ramps and/or walks, and the nosing of stair treads to the top of handrail gripping surfaces.
4. Handrails shall be continuous without breaks or interruptions for the length of the stair or ramp run, and include handrail extensions. The inside handrail of stairs and ramps that change direction shall be continuous between stair or ramp runs.
5. Finish:
 - a. Exterior Handrails: Galvanize after fabrication.

D. Guards:

1. Material: Schedule 40 steel pipe or round steel tubing of equivalent diameter and wall thickness of sizes indicated.
2. Diameter: As follows unless otherwise indicated on Drawings:
 - a. Posts, and Top and Bottom Rails: 1-1/2 inch diameter schedule 40 pipe (1.9 inch outside diameter).
 - b. Intermediate Rails: 1 inch diameter schedule 40 pipe (1.6 inch outside diameter).
3. Height: As indicated on drawings and as follows:
 - a. 42 inches minimum measured vertically above the walking surface of ramps and/or walks, or the nosing of stair treads, to the top of guards.
 - 1) Height may be reduced to 36 inches measured vertically above the walking surface of ramps, walks, or the nosing of stair treads, to the top of guards, where the upper walking surface is not more than 30 inches above the lower adjacent ground surface.
4. Openings: Openings between intermediate rails or panels, and between posts and adjacent construction, shall be such that a 4 inch diameter sphere shall not pass through any opening where the upper walking surface is more than 30 inches above the lower adjacent ground surface.
5. Bottom Rails: Provide bottom rails matching post size and material with the centerline located 3 inches (2 inches minimum/4 inches maximum) above the walking surface where curbs are not provided below guards.
6. Finish:
 - a. Exterior Handrails: Galvanize after fabrication.

- E. Post Sleeves: Where posts are indicated to be installed in sleeves, provide sleeves as detailed on Drawings; fabricate sleeves from steel pipe or tubing of length indicated and having an inside diameter not less than 1/2 inch greater than the outside diameter of the post; cap bottom of sleeves with a steel plate.
- F. Connections: Fabricate railings with welded connections unless otherwise indicated.
- G. Changes in Direction: Form changes in direction by bending or by inserting prefabricated elbows.
 - 1. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- H. Close exposed ends of railing members with prefabricated end fittings.
- I. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated; Close ends of returns.
- J. Handrail Surfaces: Grind and finish handrails and welds smooth to be free of sharp, rough, or abrasive surfaces.
- K. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - 1. Provide crush-resistant fillers or other means to transfer loads through plaster or gypsum board wall finishes to structural supports to prevent bracket or fitting rotation and crushing of substrate.
 - 2. Horizontal projections of handrail brackets shall provide 1-1/2 inch minimum clearance below the bottom of handrails (CBC 11B-505.6).
 - 3. Handrail brackets shall provide 1-1/2 inch minimum clear between handrails and adjacent wall surfaces or other obstructions.
- L. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- M. Expansion Control: Provide internal sleeves for continuous rails requiring provisions for expansion control.

2.10 STEEL FINISHES

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

- C. Galvanizing: Hot-dip galvanize exterior items and items indicated to be galvanized after fabrication to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- D. Shop Priming: Shop prime items not to be galvanized unless they are to remain unfinished or are embedded in concrete, or masonry, or unless otherwise indicated; shop prime galvanized items that are to receive field applied top coats.
1. Maintain identification markings of steel used for structural purposes until steel has been erected. Mill markings may be covered by shop priming provided the fabricator provides identification mark over the primer that can be traced through documentation.
 2. Preparation of Surfaces:
 - a. Cleaning of Galvanized Items for Shop Priming: Where galvanized items are to receive field applied top coats, prepare for priming after galvanizing by thoroughly cleaning galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
 - b. Surface Preparation: Prepare surfaces to comply with the following:
 - 1) Non-Galvanized Items:
 - a) Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - b) Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
 - 2) Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."
 3. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - a. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing and conditions by other Specification Sections where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports as indicated on Drawings and to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor support framing securely to, and rigidly brace from, building structure.

3.4 INSTALLING METAL BOLLARDS

- A. Fixed Bollards Anchored in Concrete: Anchor bollards in place with concrete footings as indicated on Drawings; center and align bollards in holes 3 inches above bottom of excavation; place concrete and vibrate or tamp for consolidation; contour top surface of concrete to slope/drain away from bollard; support and brace bollards in position until concrete has cured.
 - 1. Fill bollards solidly with concrete, mounding top surface to shed water.

3.5 INSTALLING RAILINGS AND GUARDS

- A. Railing and Post Connections, General: Use fully welded joints for permanently connecting components; comply with requirements for welded connections in Part 2 Articles "Fabrication, General" and "Railings and Guards" whether welding is performed in the shop or in the field.
- B. Anchoring Posts in Concrete: Anchor posts as indicated on Drawings and as follows:
 - 1. Sleeves: Clean holes of loose material, insert posts, and fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
 - 2. Cored Holes in Concrete: Core-drill holes not less than 6 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
 - 3. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

3.6 REPAIRS

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

SECTION 061053
MISCELLANEOUS 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. Wood blocking and nailers.

- B. Related Sections:

- 1. Division 03 Section "Post Installed Concrete Anchors" for post installed anchors in concrete.
 - 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.

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. Power-driven fasteners.
3. Powder-actuated fasteners.
4. Post installed concrete anchors.
5. 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-2022).

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.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A 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.
 - 1. Wood-Preservative treated dimension lumber used for sill plates shall be Douglas Fir, WCLIB or WWPA, No. 2 or better.

2.4 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.

2.5 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.

2.6 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).

2.7 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.

2.8 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 chlorpyrifos 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. 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.
- C. 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.
- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.
- F. Do not splice structural members between supports, unless otherwise indicated.

- G. 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.
 - H. 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.
 - I. 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.
 - J. 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."
 - K. 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.
 - L. Fasteners and connectors in contact with preservative treated or fire retardant treated wood shall be corrosion resistant as specified under Part 2 product requirements.
 - M. 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 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 061626
UNDERLAYMENT

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. Wood panel underlayment.
- B. Related Requirements:
 - 1. Division 09 Sections as applicable to adhered resilient flooring.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sample Warranties: For special warranties.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect underlayment from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.5 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 80 deg F, in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace products that fail in materials or workmanship within specified warranty period.
1. Warranty shall also include consequent removal and replacement of finish flooring materials that may be required due to replacement of defective underlayment panels.
 2. Failures include, but are not limited to, the following:
 - a. Splitting or cracking when installed.
 - b. Delamination of panels.
 - c. Discoloration of finish floor materials due to underlayment panels.
 - d. Failure to bond with flooring adhesives.
 3. Warranty does not include failure due to the following:
 - a. Poor workmanship or installer's failure to follow installation instructions.
 - b. Misuse, abuse, or damage to underlayment panels after delivery.
 - c. Damage to underlayment panels due to physical damage to installed finished flooring materials.
 - d. Defective subflooring or subflooring installation.
 - e. Exposure to water or excessive moisture due to faulty plumbing or leaks.
 - f. Fire, flood, earthquake, or other natural disaster.
 4. Warranty Period: Lifetime of installation.

PART 2 - PRODUCTS

2.1 UNDERLAYMENT

- A. Basis of Design: Drawings and Specifications are based on the following:
1. Traxx Corporation; Matrixx Engineered Underlayment.
 - a. Subject to compliance with requirements, provide product indicated or a comparable product subject to a request for substitution.
- B. Description: Engineered laminated wood underlayment of the following properties:
1. Wood Species: Russian birch.
 2. Panel Thickness: 6 mm.
 3. Glue: Exterior grade phenolic glue, E1 exposure rating, passes boil test.
 4. Face: Fully sanded with no open knots or defects; knots over 1/4 inch plugged.
 5. Core: 100% solid, no voids.
 6. Back: No open knots or open defects larger than 3/4 inch; larger knots are plugged or filled.
 7. Thickness Tolerance: +/-1/32 inch.
 8. Squareness Variation: Adjoining sides are square within +/-1/32 inch.

2.2 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
- B. Nails and Staples: ASTM F 1667.
 - 1. To prevent staining of flooring, do not use uncoated, cement coated, or rosin coated fasteners.
 - 2. Nails: Plated ring shank underlayment nails with a 3/16 inch diameter head.
 - 3. Staples: Double coated chisel or divergent point staples with a 1/4 inch maximum crown.

2.3 MISCELLANEOUS MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for conditions affecting performance of the Work.
- B. Verify that substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of ridges, depressions, and foreign deposits that might interfere with installation of underlayment.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Reset any subfloor fastener heads that protrude above the surface of the subfloor.
- D. Underlayment panels shall be acclimated to the temperature of the space where they are to be installed in accordance with panel manufacturer's written instructions and for a period of not less than 48 hours prior to installation.
- E. Sweep and vacuum clean substrates to be covered by underlayment panels immediately before installation.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions and CPA's recommendations for type of subfloor indicated for preparing and applying underlayment.
- B. Underlayment Panel Installation:
 - 1. Layout panels perpendicular to grain of subfloor.
 - 2. Offset joints of underlayment panels a minimum of 8 inches from joints subfloor panels.
 - 3. Stagger underlayment panels approximately one half panel intervals to ensure that 4 panel corners never meet.
 - 4. Lightly butt panel edges together, do not leave a gap.
 - 5. Arrange factory-cut edges to factory-cut edges.
 - 6. Cut panels at penetrations, edges, and other obstructions of work; allow a 1/4 to 1/2 inch gap between the panel edge and abutting construction.
- C. Fastening Method: Nail or staple underlayment to subflooring.
 - 1. Edge Fastener Spacing: 2 inches on center.
 - 2. Field Fastener Spacing: 4 inches on center in each direction.
 - 3. All fasteners shall be slightly countersunk.
 - 4. Select fasteners of a size that will not penetrate the underside of the subfloor.
 - 5. Begin fastening at one corner and work across the panel fastening the farthest corner last.
- D. Patch all voids, chipped edges, gouges and gaps with patching compound, sand smooth when dry.
- E. Fill and sand edge joints of underlayment receiving resilient flooring immediately before installing flooring, avoid over sanding.

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 "Miscellaneous Rough Carpentry."
 - 2. Division 07 Section "Sheet Metal Flashing and Trim."
 - 3. 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/ft² at 75 Pa, when tested in accordance with ASTM E2178. Type I per ASTM E1677. ≤0.04 cfm/ft² 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/yd², 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 FIELD MOCKUP

- A. Prior to the installation of the flexible flashing and weather resistive barrier, the general contractor is to provide a field mock-up at a door and window opening for review and acceptance.

3.4 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.

3.5 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.

3.6 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.

3.7 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 074213
FORMED METAL WALL AND SOFFIT PANELS

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 Panels: Concealed fastener lap seam metal wall panels including associated trim and flashings.
- 2. Soffit Panels: Concealed fastener lap seam metal soffit panels including associated trim and flashings.
 - a. Formed metal wall and soffit panels shall be of the same manufacturer and the installation of all panel types shall be under the responsibility of one installing entity.

B. Related Sections:

- 1. Division 07 Section "Sheet Metal Flashing and Trim" for additional requirements for sheet metal flashing and trim.
- 2. Division 07 Section "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

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 each type of panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details. Distinguish between factory and field-assembled work.
- C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
 - 1. Include similar Samples of trim and accessories involving color selection.

- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Metal Wall Panels: At least 6 inch square sample showing seam profile and color selected on same material of panels.
- E. Qualification Data: For Installer.
- F. Field quality-control reports.
- G. Warranties: Samples of special warranties.
- H. Maintenance Data: For metal panels to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by panel manufacturer.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Owner's Project Inspector, Architect, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of accessories.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
 - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
 - 5. Review loading limitations of supporting structure.
 - 6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
 - 7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 - 8. Review temporary protection requirements for metal panel systems during and after installation.
 - 9. Review procedures for repair of metal panels damaged after installation.
 - 10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.7 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal panel work to be performed according to manufacturer's written instructions and warranty requirements.

1.8 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

- A. Manufacturer's standard 10-year wall system weathertightness warranty, jointly signed by the installer and manufacturer. The warranty shall not place any limitations on wind speed, up to a maximum design wind speed as given in Article 2.1 of this specification from date of Substantial Completion.
- B. Manufacturer's standard 20-year finish warranty covering checking, crazing, peeling, chalking, fading, and adhesion of the prepainted sheet metal materials from date of Substantial Completion.
- C. Installer's 3-year warranty covering wall panel system installation and watertightness from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
- C. Uniform Wind Load Capacity
 - 1. Installed wall system shall withstand negative wind pressures complying with the following criteria.
 - a. Design Code: ASCE 7, Method 2 for Components and Cladding
 - b. Safety Factor: The tested failure load, as determined by physical testing according to the ASTM E330 method, shall be reduced by a factor 1.67 to determine the allowable wind load on the system.
 - 2. The ultimate capacity of the panel system shall be determined based on performance testing in accordance with ASTM E330. The allowable load carrying capacity shall be calculated by reducing the ultimate test load at failure by the safety factor listed herein.
 - 3.
- D. Air Infiltration, Wall Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of area when tested according to ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft., positive pressure.
- E. Water Penetration, Wall Panels: No uncontrolled water penetration when tested according to ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure with no leakage: 5 Gal/Hr per S.F. and Static Air Pressure of 12.0 psf for 15 min.
- F. Interface between panel and clip shall provide for unlimited thermal movement in each direction along the longitudinal direction.
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. The design temperature differential shall not be less than 220 degrees Fahrenheit.

2.2 MANUFACTURERS

- A. Source limitations: Formed metal wall and soffit panels shall be of the same manufacturer as standing seam metal roof panels specified in Division 07 Section "Standing Seam Metal Roof Panels" and the installation of all panel types shall be under the responsibility of one installing entity.

2.3 CONCEALED-FASTENER, LAP-SEAM METAL WALL AND SOFFIT PANELS

- A. General: Provide factory-formed metal wall and soffit panels designed to be field assembled by interlocking seams incorporating concealed anchor clips, allowing thermal movement. Concealed clip, lap-seam wall panels with ribs at 6 inches on center.
- B. Pan-Rib 'D' Profile, Concealed-Fastener Metal Wall Panels: Formed with raised, ribs equally spaced across panel with 1-inch reveals.

1. Basis-of-Design Product: Drawings and specifications are based on the following:

- a. IMETCO LATITUDE Wall system as manufactured by Innovative Metals Company, Inc. (IMETCO)
- b. Panel: LW6S-6R10

- 1) Subject to compliance with requirements, provide product indicated or a comparable product by one of the following:

- a) AEP Span a Division of ASC Profiles, Inc
- b) CENTRIA Architectural Systems.
- c) MBCI, a division of NCI Building Systems.
- d) McElroy Metal, Inc.
- e) Morin Corporation.
- f) Taylor Metal Products.

2. Painted, metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A755/A755M.

- a. Recycled Content: Provide steel sheet with average recycled content such that postconsumer recycled content plus one-half of pre-consumer recycled content is at least 70 percent.
- b. 22 gauge, Zinc-Coated (Galvanized) Steel Sheet, as per ASTM A653: G90 coating designation; structural quality, grade 40 ksi
- c. Material: Zinc-coated (galvanized) steel sheet, 0.029-inch nominal thickness.
- d. Nominal Thickness: 0.028 inch (22 gauge).

- e. Exterior Finish: Exposed Coil-Coated Finish. Two-coat fluoropolymer. AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Manufacturers' approved applicator to prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - f. Coating system shall provide nominal 1.0 mil dry film thickness, consisting of primer and color coat.
 - 1) Color: As selected by Architect from manufacturer's full range.
- 3. Concealed Finish: Apply pretreatment and 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.
 - 4. Panel Profile:
 - a. Panel Coverage Width: 6 inches nominal.
 - b. Panel Height: 7/8 inches.
 - c. Panel Length: Up to 20 feet.
 - d. Surface: Smooth.
 - e. Design: "C" Style Flange
 - f. Standard Profile: Ribs at 6 inches on center.
- C. Anchor Clip System: Clips shall be 18 gauge galvanized steel designed to allow thermal movement of the panel in each direction along the longitudinal dimension.

2.4 UNDERLAYMENT MATERIALS

- A. Self-Adhering with reinforcing scrim, Vapor Impermeable, High-Temperature Sheet: 60-mils thick minimum, consisting of slip-resisting top surface laminated to SBS-modified asphalt adhesive, with release-paper backing; cold applied.
 - 1. Thermal Stability: Stable after testing at 250 deg F; ASTM D 1970.
 - 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
 - 3. Seams shall be lapped in accordance with manufacturer's recommendations.
 - 4. Underlayment shall be approved for 90 days (minimum) of exposure to UV and weather penetrations.
 - 5. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aqua Block 50 by IMETCO of Norcross, GA.
 - b. Aqua Block 60 by IMETCO of Norcross, GA
 - c. Intellwrap UDL by IMETCO of Norcross, GA
- B. Self-Adhering, Vapor Permeable Sheet: 25-mils- thick, minimum, consisting of a multi-layer polypropylene porous film laminate with a vapor permeable adhesive; cold applied.
 - 1. Water Vapor Permeance, ASTM E 96 Method B: 50 perms minimum.
 - 2. Water Resistance, AATCC 127, 22-inch hydrostatic head for 5 hours: No leakage.

3. Seams shall be lapped in accordance with manufacturer's recommendations.
 4. Underlayment shall be approved for 50 days (minimum) of exposure to UV and weather penetrations.
- C. Mechanically Attached, Vapor Permeable Sheet: 20-mils thick, minimum, consisting of multiple layers of UV stabilized spun-bonded polypropylene.
1. Water Vapor Permeance, ASTM E 96 Method B: 200 perms, minimum.
 2. Water Resistance, AATCC 127, 22-inch hydrostatic head for 5 hours: No leakage.
 3. Seams shall be lapped in accordance with manufacturer's recommendations.
 4. Fasteners: Manufacturer's recommended corrosion-resistant, cap-headed steel or stainless steel nails, staples, or screws used in conjunction with manufacturer's spray adhesive, as appropriate for substrate.
 5. Underlayment shall be approved for 42 days (minimum) of exposure to UV and weather penetrations.

2.5 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fascia, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
1. Closures: Provide closures fabricated of same metal as metal panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
 4. Corner Units: For horizontally oriented panel installations only, provide factory fabricated mitered corner units of the same profile(s) as specified. Corner units shall be furnished for outside and inside corner conditions.
- C. Flashing and Trim: Flashing and trim formed from same material and thickness as panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

- D. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.
 - 1. Concealed fasteners: Corrosion resistant steel screws, #10 minimum diameter x length appropriate for substrate, hex washer head or pancake head. Use self-drilling, self-tapping for metal substrate or A-point for plywood substrate.
 - 2. Exposed Fasteners: 3xx series stainless steel screws (cadmium or zinc coatings are not acceptable) with neoprene sealing washer, or 1/8-inch diameter stainless steel rivets.
- E. Panel Sealants: Provide sealant type recommended by panel manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Seam Sealant: Field Applied Butyl-Based, Solvent-Release, One-Part Sealant.
 - 2. Sealant Tape: Non-curing, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1-inch wide and 1/16-inch thick.
 - 3. Exposed Sealant: : ASTM C 920; elastomeric tripolymer, polyurethane, or other advanced polymer sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer.
 - 4. Concealed Sealant: ASTM C 1311: Butyl-Based, Solvent-Release, One-Part Sealant.

2.6 FABRICATION

- A. Fabricate and finish metal panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Form flashing components from full single width sheet in minimum 10'-0" sections. Provide mitered trim corners, joined using closed end pop rivets and butyl-based, solvent released one-part sealant.

3. End Seams for Coil Coated Finished Material: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
4. End Seams for Field Finished Material: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
5. Sealed Joints: Form nonexpanding but movable joints in metal to accommodate butyl-based sealant to comply with SMACNA standards.
6. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
7. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal panel manufacturer for application, but not less than thickness of metal being secured.

2.7 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: 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 Panels and Accessories:
 1. Exposed Surfaces: Two-coat fluoropolymer AAMA 621 finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 2. Concealed Finish: Apply pretreatment and 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.

2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before metal panel installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.
- B. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.
- C. Establish straight, side and crosswise benchmarks
- D. Use proper size and length fastener for strength requirements. Approximately 5/16 inch is allowable for maximum fastener head size beneath the panel.
- E. All walls shall be checked for square and straightness. Inside and outside corners may not be plumb; set a true line for the corner units and flashing with string line.
- F. Measure the wall lengthwise to confirm panel lengths and verify clearances for thermal movement.

3.3 UNDERLAYMENT INSTALLATION

- A. Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply over entire wall surface, wrinkle free, in shingle fashion to shed water, and 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 90 days.

3.4 METAL WALL AND SOFFIT PANEL INSTALLATION

- A. All details will be shown on in accordance with approved shop drawings and manufacturer's product data, within specified erection tolerances.

- B. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
- C. Installation of Wall Panels: Wall panels can be installed by starting from one end and working towards the opposite end (vertical orientation), or from the bottom of wall working towards the top of the wall (horizontal orientation).
- D. Isolate dissimilar metals and masonry or concrete from metals with bituminous coating. Use gasketed fasteners where required to prevent corrosive action between fastener, substrate, and panels.
- E. Limit exposed fasteners to extent indicated on contract drawings.
- F. Seal laps and joints in accordance with wall panel system manufacturer's product data.
- G. Coordinate flashing and sheet metal work to provide weathertight conditions at wall terminations. Fabricate and install in accordance with standards of SMACNA Manual.
- H. Provide for temperature expansion/contraction movement of panels at wall penetrations and wall mounted equipment in accordance with system manufacturer's product data and design calculations.
- I. Installed system shall be true to line and plane and free of dents, and physical defects. In light gauge panels with wide flat surfaces, some oil canning may be present. Oil canning does not affect the finish or structural integrity of the panel and is therefore not cause for rejection.
- J. At joints in linear sheet metal items, set sheet metal items in two ¼-inch beads of butyl sealant. Extend sealant over all metal surfaces. Mate components for positive seal. Allow no sealant to migrate onto exposed surfaces.
- K. Remove damaged work and replace with new, undamaged components.
- L. Touch up exposed fasteners using paint furnished by the panel manufacturer and matching exposed panel surface finish.
- M. Clean exposed surfaces of wall panels and accessories after completion of installation. Leave in clean condition at date of substantial completion. Touch up minor abrasions and scratches in finish.

3.5 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 - 2. 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 corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal wall panel units within installed tolerance of 1/4 inch in 20 feet at location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.
- B. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

3.8 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

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. Formed sheet metal fabrications:
 - a. Flashing and trim.
 - b. Miscellaneous sheet metal fabrications.
2. Manufactured Sheet Metal Flashing Products:
 - a. Manufactured reglets and counter flashing.

- 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 and wall panels for sheet metal flashing and trim integral with metal roof and wall panel systems.
3. Division 07 Section "Joint Sealants" for field-applied sheet metal flashing and trim sealants.

1.3 SUBMITTALS

- A. Product Data: For each of the following

1. Underlayment materials.
2. Sealants.
3. Epoxy seam sealer.
4. Manufactured sheet metal products.

- 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.

1.4 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.
1. For roof edge flashings that are SPRI ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.
- 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 **fascia** and **fascia trim**, 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.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
 - 3. Review requirements for insurance and certificates if applicable.
 - 4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.6 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.

1.7 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 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, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing and Waterproofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements as applicable for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Install roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressures:
 - 1. Horizontal Outward Pressure: 24 psf.
 - 2. Vertical Upward Pressure: 75 psf.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (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. Metallic-Coated Steel Sheet: 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.
 - 1. Surface: Smooth, flat, and finished as follows:
 - a. Mill phosphatized for field painting.
 - b. Manufacturer's standard clear acrylic coating on both sides for metal to be left exposed and unpainted.
 - c. Unfinished for concealed metal.
 - d. Coil-Coated Finish:

- 1) 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.
 - a) Color: As selected by Architect from manufacturer's full range.
- 2) 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.

C. Lead Sheet: ASTM B749 lead sheet.

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 Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene or polypropylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.
 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.
- D. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

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 as 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. Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 3. Fasteners for Stainless Steel Sheet: 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. Solder for Stainless Steel: ASTM B32, Grade Sn60 or Grade Sn96, with acid flux of type recommended by stainless steel sheet manufacturer.
- E. 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.
- F. 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.
- G. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- H. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- I. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- J. 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: One of the following:
 - a. Galvanized steel, 0.022 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. Custom fabricate sheet metal flashing and trim to comply with details indicated on Drawings and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 2. 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.
 3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
 4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners 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 indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.
- C. Expansion Provisions: Form metal to accommodate thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.
- 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 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Splash Pans: Fabricate to dimensions and shape required and from 0.028 inch (24 gage) thick galvanized steel.

2.8 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Material, General: Fabricate low-slope roof sheet metal fabrications from galvanized steel or aluminum-zinc alloy coated steel, 0.034 inches (22 gauge) thickness unless otherwise indicated.

- B. Roof Edge Flashing: Fabricate in minimum 96-inch long, but not exceeding 12 foot long, sections. Furnish with 6-inch wide joint cover plates.

- 1. Joint Style: Lap, 4 inches wide.

- C. Miscellaneous Low-Slope Roof Flashing: Fabricate to profiles indicated on Drawings and as required for project conditions.

2.9 WALL SHEET METAL FABRICATIONS

- A. Material, General: Fabricate wall sheet metal fabrications from galvanized steel or aluminum-zinc alloy coated steel, 0.028 inches (24 gauge) thickness unless otherwise indicated.
- B. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch long, but not exceeding 12 foot long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch high end dams.
- C. Opening Flashings in Frame Construction: Fabricate head, sill, and similar flashings to extend 4 inches beyond wall openings. Form sill flashing with 2-inch high end dams.

2.10 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Miscellaneous Sheet Metal Fabrications: Fabricate from galvanized steel or aluminum-zinc alloy coated steel, 0.028 inches (24 gauge) thickness 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, substrate, and other conditions affecting performance of the 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.
 - 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

- 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, wrinkle free, using adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Install underlayment in shingle fashion to shed water, lap joints not less than 2 inches.
- C. Self-Adhering, High-Temperature Sheet Underlayment: Install self-adhering, high-temperature 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.
- D. Slip Sheet: Where slip sheet is used, install slip sheet, wrinkle free, before installing sheet metal flashing and trim. Install in shingle fashion to shed water. Lapp joints not less than 4-inches.

3.3 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
 - 1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 2. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 4. 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.
 - 5. Install continuous cleats with fasteners spaced not more than 12-inches on center.
 - 6. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling, and tool marks.
 - 7. Install sealant tape where indicated.
 - 8. Do not field cut sheet metal flashing and trim by torch.
 - 9. Do not use graphite pencils to mark metal surfaces.

- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat back side of uncoated aluminum and stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with a slip 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. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints; use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fasteners of sizes complying with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
1. Wood Framing, Blocking, and Sheathing: Use fasteners that will penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws, and not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
 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. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated.
 - a. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant.
 - b. When ambient temperature at time of installation is 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."

- G. 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, 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.
 - 3. Heat surfaces to receive solder and flow solder into joint; fill joint completely; completely remove flux and spatter from exposed surfaces.
- H. Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

3.4 INSTALLATION OF ROOF FLASHINGS

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1, anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
- C. 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 snap-in installation and sealant or lead wedges and sealant, interlocking folded seam or blind rivets and sealant, or anchor and washer at 36-inch centers unless otherwise indicated.

3.5 INSTALLATION OF WALL FLASHINGS

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Openings Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings, unless otherwise indicated.
- C. Reglets and Counterflashing: Install in accordance with manufacturer's written installation instructions.

3.6 INSTALLATION OF MISCELLANEOUS FLASHINGS

- A. General: Install miscellaneous sheet metal flashings in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of miscellaneous flashings with installation of adjacent components.
- B. 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

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.

3.9 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trims are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.
- C. Maintain sheet metal flashing and trim in clean condition during construction.

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

- B. Related Sections:

- 1. Division 32 Section "Concrete Paving Joint Sealants" for exterior concrete paving joint sealants.

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. 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.
- D. 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.

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 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.

3.5 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 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 as required by NFPA 101.
- B. Related Sections include but are not limited to the following:
 - 1. Division 32 Section "Chain Link Gates".

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 80: Fire Doors and Windows.
 - b. NFPA 101: Life Safety Code.
 - c. NFPA 105: Smoke and Draft Control Door Assemblies
 - d. NFPA 252: Fire Tests of Door Assemblies.
 - 6. UL - Underwriters Laboratories.
 - a. UL 10C: Positive Pressure Fire Tests of Door Assemblies.
 - b. 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. Field quality-control reports.
- E. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include "as installed" final hardware and keying schedule.
- F. 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.
- G. 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. Egress Door Assemblies: comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4.

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.
- D. Existing Openings: Where new hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide for proper operation.

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: Ten (10) 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, 1010.2.1, 1010.2.3).
 - 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 (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 wheelchair 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 1010.2.8).

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
Lock and Latch sets, Cylinders, and Key System	Schlage	District standard, no substitution
Exit Devices	Corbin Russwin	District standard, no substitution
Thresholds	Pemko	District standard, no substitution

- B. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, 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. 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.
5. Cylindrical Locksets: Extra Heavy Duty and as follows:
 - a. Chassis: Cylindrical design; corrosion-resistant plated cold-rolled steel, through-bolted.
 - b. Locking Spindle: Stainless steel, integrated spring and spindle design.
 - c. Latch Retractors: Forged steel; balance of inner parts corrosion-resistant plated steel or stainless steel.
 - d. Latchbolt: Solid steel.
 - e. Lever Trim: Accessible design, independent operation, spring-cage supported, minimum 2 inch clearance from lever mid-point to door face.
 - f. 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.
 - g. Certifications:
 - 1) ANSI A156.2, 1994, Series 4000, Grade 1.
 - 2) UL listed for A label and lesser class single doors up to 4ft x 8ft.

C. 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 3/4" 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.

- D. Door Bolts: For pairs of doors utilizing cylindrical or mortise locksets; provide bolts as scheduled and as follows:
 - 1. Automatic Flush Bolts: Provide automatic flush bolts at pairs of doors from occupiable spaces. Utilize top bolt only models for interior doors where applicable and as permitted by testing procedures.
 - 2. Manual Flush bolts: Provide manual flush bolts only when permitted on storage or mechanical room openings as scheduled.
 - 3. Dust Proof Strikes: Provide dust proof strikes at openings using bottom bolts.
 - 4. Coordinators: Provide coordinators at openings using automatic flush bolts.
- E. Lock Protectors: Fabricated from stainless steel with internally threaded fasteners for flat head machine screws through bolted to door; hex head or carriage bolt fasteners will be permitted.
- F. Thresholds: Aluminum and as detailed or scheduled; provide at all exterior doors.

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. Construction Keying: Provide a method of independent of the final keying system for securing the building during construction. Contractor must supply Schlage construction cylinders.
- B. Review and confirm keying requirements and key system with Owner.
- C. Final Keying System: Schlage "Primus" System, Security Level Three, Type EP keyways using 20-700 controlled access cylinders as determined by District. Provide Interchangeable Cores (IC) at all panic devices and where called for in the Hardware Schedule. All cylinders/IC cores and **Bitting Schedule** shall be provided to District by Hardware Supplier at the time of delivery of the locks. Cylinders/IC Cores shall be Master Keyed by District's Hardware Department, using Schlage Primus System. After Keying all Cylinders/IC Cores shall be issued back to the General Contractor for Installation. This requires a coordination meeting with the GC, Hardware Supplier, Schlage Representative, District Locksmith, and Architect, to be scheduled by the GC within 3 weeks of the Notice to Proceed.
- D. Furnish a Grand Master, Master, keyed alike or keyed different system as directed by the Owner or Architect.
- E. Key Blanks: Standard "6" pin bow key blank; tag to identify.

F. Supply keys and blanks as follows:

1. Supply 4 cut change keys for each different change key code.
2. Supply 6 cut master keys for each different master key set.
3. Supply 20 Emergency Keys.
4. Supply 100 EP Primus Blanks; one side embossed.
5. Supply 100% additional Bitting Codes.

G. Finish: All finishes to be satin chromium plated, US 26 D unless otherwise indicated.

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.
2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
3. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
4. 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.
5. Screws for butt hinges shall be flathead, countersunk, full-thread type.
6. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.
7. Provide stainless steel expansion anchors for attaching hardware items to concrete or masonry.
8. All exit devices and 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. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. 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.
- G. 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. 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.
- D. Prepare and submit separate inspection reports for each egress door assemblies indicating compliance with each item listed in NFPA 80 and NFPA 101, Section 7.2.1.15.6.
- E. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- F. 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:

CR	=	Corbin Russwin	Panic Hardware, Pulls
KEE	=	Keedex	Weldable Strike Boxes
LOC	=	Locinox	Hinges at Pedestrian Gates
PEM	=	Pemko	Thresholds
SCH	=	Schlage Lock Company	Locks & Cylinders

D. Door Hardware Sets:

HW SET 01: CLASSROOM EXTERIOR DOORS

Each to have the following:

1	EA	PANIC HARDWARE	ED5202SA X N955ET X M54	626	CR
2	EA	RIM CYLINDER	20-757 (IC)	626	SCH
1	EA	THRESHOLD	158A		PEM

HW SET 02: OFFICE

Each to have the following:

1	EA	OFFICE LOCK	ND91PD, RHO	626	SCH
1	EA	LOCKSET	20-765	626	SCH

HW SET 03: RESTROOMS

Each to have the following:

1	EA	RESTROOM LOCK	ND85PD, RHO	626	SCH
1	EA	LOCKSET	23-000	626	SCH

E. Gate Hardware Sets

HW SET 04: MAINTENANCE GATE (3'-0" – 4'-0" WIDE LEAF)

Each to have the following:

1	EA	STOREROOM LOCK	ND96PD, RHO	626	SCH
1	EA	LOCKSET		626	SCH
1	EA	WELDABLE STRIKE	K-BXRHO		KEE
		BOX			

BALANCE OF HARDWARE BY GATE MANUFACTURER

HW SET 05: N/A

HW SET 06: N/A

HW SET 07: PEDESTRIAN ACCESSIBLE GATE (PH WITH WING PULL)

Each to have the following:

1	EA	PANIC HARDWARE	ED8200 X P857ET X M54	689	CR
1	EA	RIM CYLINDER	20-700 (IC)	626	SCH
1		SET HINGES	MAMMOTH 180	ZILV	LOC
1	EA	WELDABLE STRIKE	K-BXEDCR		KEE
		BOX			

BALANCE OF HARDWARE BY GATE MANUFACTURER

HW SET 08: PEDESTRIAN ACCESSIBLE GATE (PH WITH LEVER)

Each to have the following:

1	EA	PANIC HARDWARE	ED8200 X N655ET X M54	689	CR
1	EA	RIM CYLINDER	20-700 (IC)	626	SCH
1		SET HINGES	MAMMOTH 180	ZILV	LOC
1	EA	WELDABLE STRIKE	K-BXEDCR		KEE
		BOX			

BALANCE OF HARDWARE BY GATE MANUFACTURER

END OF SECTION

SECTION 092400
PORTLAND CEMENT PLASTERING

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. Exterior portland cement plasterwork (stucco) with acrylic finish, including lath and accessories installed over plywood wall sheathing installed over wood stud framing; section includes the following:
 - a. Lath.
 - b. Cement plaster scratch and brown coats.
 - c. Lamina base coat of acrylic modified cement skim coat embedded in fiber mesh applied over the cement plaster brown coat.
 - d. Acrylic finish coat.

B. Related Sections:

- 1. Division 07 Section "Weather Resistive Barriers" for building wrap and flexible flashing included in portland cement plaster assemblies.
- 2. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal items installed in conjunction with cement plaster assemblies.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated and/or included in the Work.
- B. Samples for Initial Selection: For each type and color of factory-prepared finish coat indicated.
- C. Samples for Verification: For each texture and color of finish coat indicated; 36 by 36 inches and prepared on rigid backing.
- D. Research/Evaluation Reports: From ICC-ES or IAPMO ES, for metal lath.

1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups of area directed by Architect to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Mockups shall include and demonstrate the installation and/or finish of the following:
 - a. Weather resistive barrier and flexible flashing at door and window openings.
 - b. Sheet metal flashing and trim at door and window openings.
 - c. Lath and accessories.
 - d. Terminations and transitions to other surfaces and materials.
 - e. Cement plastering.
 - 2. Contractor shall coordinate mockups requiring multiple trades.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Owner's Project Inspector, Architect, and installers whose work interfaces with or affects exterior wall systems, work trades include but are not limited to the following:
 - a. Wall Framing.
 - b. Wall sheathing.
 - c. Weather resistive barriers.
 - d. Flashing.
 - e. Portland cement plastering.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review and coordinate installation requirements and installation schedule for each trade.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.7 COORDINATION

A. Coordinate plaster work with work of the following Sections:

1. Division 07 Section "Sheet Metal Flashing and Trim".

1.8 FIELD CONDITIONS

A. Comply with ASTM C 926 requirements.

B. Exterior Plasterwork:

1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
2. Apply plaster when ambient temperature is greater than 40 deg F.
3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

C. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

PART 2 - PRODUCTS

2.1 METAL LATH

A. Basis of Design: Where Basis of Design named manufacturer products are indicated, Design, Drawings, and Specifications are based on products by the following:

1. The Structa Wire Corporation.
 - a. Subject to compliance with requirements, provide products indicated or submit request for substitution per Division 01 Section "Substitution Procedures."

B. Welded Wire-Fabric Lath for Walls:

1. Basis of Design: Design and details are based on the following:
 - a. Structa Wire Corporation; Megalath (IAPMO UES ER 2017).
2. Self-furred welded wire fabric lath without paper backing and as follows for use over solid sheathed vertical surfaces.
 - a. Size: 30 inch by 108 ft. roll.
 - b. Wire Spacing: 1.5 inch by 0.7 inch rectangular grid.
 - c. Wire: Hot-dipped galvanized, low-carbon, cold-drawn steel wire complying with ASTM A641-2, Class 1.

- 1) Longitudinal (Horizontal) Wires: Wire flattened to dimensions of 0.033 inches by 0.075 inches by cold rolling.
 - 2) Cross (Vertical) Wires: 0.56 inch diameter wire having 1/4 inch high furring crimps spaced 2.125 inches on center.
- d. Welding: Each intersection of longitudinal and cross wires shall be electrical resistance welded.
 - e. Self-Furring: 1/4 inch minimum.
 - f. Nominal weight of Lath: 1.95 lb/sq. yd.

C. Corner Reinforcement:

1. Basis of Design: Design and details are based on the following:
 - a. Structa Wire Corporation; VTruss Straight Corner (ICC # ESR 2017).

2.2 ACCESSORIES

- A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
 - b. CEMCO.
 - c. Clark Dietrich Building Systems.
 - d. MarinoWARE.
 - e. Stockton Products.
2. Foundation Weep Screed: Fabricated from hot-dip galvanized-steel sheet, ASTM A 653/A 653M, G60 zinc coating.
3. Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
4. Control Joints: Fabricated from zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
5. Expansion Joints: Fabricated from zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.
6. Two-Piece Expansion Joints: Fabricated from zinc-coated (galvanized) steel; formed to produce slip-joint and square-edged reveal that is adjustable from 1/4 to 5/8 inch wide; with perforated flanges.
7. Reveals: Fabricated from zinc-coated (galvanized) steel of configuration indicated on Drawings.

2.3 MISCELLANEOUS MATERIALS

- A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminants, manufactured for use in portland cement plaster.
- C. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of no fewer than three exposed threads.
- D. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.
- E. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter, unless otherwise indicated.
- F. Building Wrap: As specified in Division 07 Section "Weather Resistive Barriers."
- G. Paper Backing: FS UU-B-790, Type I, 60 minute Grade D, Style 2 vapor-permeable paper.
 - 1. Paper backing may be attached to lath or separate from lath.

2.4 PLASTER MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
- B. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
- C. Sand Aggregate: ASTM C 897.
- D. Reinforcing Mesh: Alkali resistant glass fiber reinforcing mesh, 4 oz. to 6 oz./sq. yd.
- E. Polymer cement (Lamina skim coat).
- F. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems, formulated with colorfast mineral pigments and fine aggregates; for use over portland cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.
 - 1. Basis of Design: Design, Drawings, and Specifications are based on the following:
 - a. Parex, Inc., E-Lastic.
 - 1) Products: Subject to compliance with requirements, provide one of the following:
 - a) Dryvit Systems, Inc.; Dryvit TAFS.

- b) El Rey Stucco Company, Inc., a brand of ParexLaHabra, Inc.; Prema-Flex.
- c) LaHabra, a brand of ParexLaHabra, Inc.; Acrylic Finish.
- d) Omega Products International, Inc.; Omega Flex Finishes.
- e) Senergy, BASF Wall Systems, Inc.; Senerflex.
- f) Sto Corp.; Powerwall Finish.
- g) Surewall, a brand of ParexLaHabra, Inc.; Acrylic Finish.
- h) SonoWall, BASF Wall Systems, Inc.; StuccoTex Finish.

2. Color: As selected by Architect from manufacturer's full range.

2.5 PLASTER MIXES

A. General: Comply with ASTM C 926 for applications indicated.

- 1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. of cementitious materials.

B. Base Coat Mixes:

- 1. Scratch and brown coats for three-coat plasterwork for use over metal lath:
 - a. Scratch Coat: For cementitious material, mix 1 part portland cement and 0 to 3/4 parts lime; use 2-1/2 to 4 parts sand per part of cementitious material.
 - b. Brown Coat: For cementitious material, mix 1 part portland cement and 0 to 3/4 parts lime; use 3 to 5 parts sand per part of cementitious material, but not less than the volume of sand used in the scratch coat.

C. Polymer Cement (Lamina skim coat): Comply with manufacturer's written instructions.

D. Factory-Prepared Acrylic Finish-Coat Mixes: Comply with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 COORDINATION

- A. General: Coordinate installation of lath, plaster, and accessories with the following:
 - 1. Building wrap and flexible flashing as specified in Division 07 Section "Weather Resistive Barriers."
 - 2. Sheet metal flashing and trim as specified in Division 07 Section "Sheet Metal Flashing and Trim."

3.3 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

3.4 PAPER BACKING

- A. Install one layer of paper backing over building wrap specified in Division 07 Section "Weather Resistive Barriers."
- B. Apply horizontally with a 3-inch overlap and a 6-inch end lap; fasten to sheathing with galvanized staples or roofing nails.
- C. Apply barrier to cover vertical flashing with a minimum 4-inch overlap, unless otherwise indicated.

3.5 INSTALLING METAL LATH

- A. Metal Lath: Install according to ASTM C 1063, lath manufacturer's written installation instructions, and as follows:
 - 1. Lath for walls shall be installed over plywood panel sheathing as specified in Division 06 Section "Plywood Panel Sheathing."
 - 2. Lath shall be installed with the long dimension perpendicular to supports.
 - 3. Lath shall be fastened to framing members through the rigid insulation and sheathing. Lath shall be fastened to each framing member with not less than No. 10 screws spaced not more than 7 inches on center, fasteners shall have not less than required minimum penetration into framing members.
 - 4. Self-furred lath shall be held out at 1/4 inch minimum from wall substrates and 3/8 inch minimum from ceiling substrates.
 - a. Self-furred lath installation shall be subject to a satisfactory jobsite demonstration with approval by the Architect, the Project Inspector, and the DSA Field Engineer (Per DSA IR 25-4).

3.6 INSTALLING TRIM ACCESSORIES

A. Install according to ASTM C 1063, at locations indicated on Drawings, and as follows:

1. VTruss Corner Reinforcement: Use at outside corners.
2. Double-V Control Joint (#30): Use at interior corners.
3. Cornerite: Use at interior corners.
4. Casing Bead: Use at exposed edges, perimeters of doors, windows, and similar openings, and where indicated on drawings.
5. Foundation Weep Screed: Use at base of walls at grade; weep screeds shall be not less than 2 inches above paved surfaces and 4 inches above earth.
6. Drip Screed: Use at soffit edges.
7. Expansion Joints, Reveals, and Aluminum Trim: Use at locations indicated on Drawings.
8. Control Joints: Unless otherwise indicated on Drawings, provide control joints at locations approved by Architect for visual effect as follows:
 - a. Where control joints occur in surface of construction directly behind plaster.
 - b. At corners of openings and where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.
 - c. As required to delineate plasterwork into areas (panels) complying with the following:
 - 1) Maximum length-to-width ratio: 2-1/2:1.
 - 2) Maximum Joint Spacing: 18 feet o.c.
 - 3) Maximum Area of Vertical Surfaces: 144 sq. ft.
 - 4) Maximum area of Horizontal Surfaces: 100 sq. ft.

3.7 PLASTER APPLICATION

A. General: Comply with ASTM C 926.

1. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot straightedge placed on surface.
2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

B. Scratch and Brown Coat Thickness: Apply scratch and brown coats over metal lath for three-coat plasterwork to the following thicknesses:

1. Walls: 3/4 inch thickness.
2. Ceilings: 5/8 inch thickness.

C. Scratch Coat: Apply scratch coat as follows:

1. Apply continuously from architectural break to architectural break with sufficient pressure to ensure keying into lath; cold joints shall not be allowed.
2. Apply in sufficient thickness to substantially cover the lath.
3. Immediately score (scarify) in a predominately horizontal direction.
4. Wipe down all corners and trim accessories and leave no cement protrusions that will interfere with application of brown coat.
5. Place "butterflies" in a diagonal direction delicately onto fresh scratch coat at the apex of window and door penetrations.
6. Keep scratch coat hydrated for a period of 48 hours, follow ASTM and/or TSIB recommendations for curing.
7. Do not apply Brown coat until scratch coat is firm and hard.

D. Brown Coat: Apply brown coat as follows:

1. Pre-wet the scratch coat to avoid excessive suction of moisture from brown coat to avoid accelerated evaporation.
2. Apply continuously from architectural break to architectural break; cold joints will not be allowed.
3. Brown coat shall be applied and filled to the accessory trim grounds, surface to be immediately darried and/or rodded to a level and plumb plane.
4. When the initial moisture has left brown coat, "hard" float the brown coat to densify, consolidate and prepare for a finish coat. Sponge floats are not acceptable. A hard float shall be considered made from wood shingle, cork, plastic, compact felt or neoprene.

E. Lamina Reinforcement Coat: Apply lamina reinforcement coat of fiberglass mesh and skim coat of polymer cement over brown coat; allow brown coat to cure a minimum of 5 days before applying lamina reinforcement coat.

F. Acrylic-Based Finish Coat: Apply acrylic based finish coat, including primers, over lamina reinforcement coat according to manufacturer's written instructions.

1. Finish texture to be as directed by Architect.

G. Concealed Exterior Plasterwork: Omit finish coat where plaster will be used as a base for adhered finishes.

3.8 PLASTER REPAIRS

A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.9 CLEANING AND PROTECTION

- A. Remove temporary protection and enclosure of other work. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION

SECTION 096513
RESILIENT BASE AND 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:
 - 1. Resilient base.
 - 2. Resilient molding accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include statement of VOC content for any adhesives or sealants.
- B. Samples for Initial Selection: For color and texture for each product indicated. For each type of product indicated, in manufacturer's standard size. Samples shall not be less than 12 inches long.
- C. Product Schedule: For resilient products, use same designations as Contract Documents.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 20 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 90 deg F, in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Burk Mercer Flooring Products; Division of Burke Industries Inc.
 - 2. Johnsonite
 - 3. Roppe Corporation, USA.
- B. Resilient Base: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
 - 1. Style: Cove (base with toe).
 - 2. Minimum Thickness: 0.125 inch.
 - 3. Height: 4 inches unless otherwise indicated on Drawings.
 - 4. Lengths: Cut lengths 48 inches long, or coils in manufacturer's standard length.
 - 5. Outside Corners: Preformed.
 - 6. Inside Corners: Job formed or preformed.
 - 7. Colors: As selected by Architect from full range of industry colors.

2.2 RESILIENT MOLDING ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Burk Mercer Flooring Products; Division of Burke Industries Inc.
 - 2. Johnsonite
 - 3. Roppe Corporation, USA.

- B. Resilient Molding Accessories: Flooring terminations, transitions, reducer strips, and accessories as indicated and/or required for project conditions.
 - 1. Material: Rubber.
 - 2. Profile and Dimensions: As indicated in Drawings and/or as required for project conditions.
 - 3. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - 1. Adhesives shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Cove Base Adhesives: VOC content of not more than 50 g/L.
 - b. Rubber Floor and Stair Tread Adhesives: VOC content of not more than 60 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
 - 1. Adhesion Testing: Perform tests recommended by floor tile manufacturer.

- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Outside Corners: Install preformed corners; install corners before installing straight pieces.
- H. Inside Corners: Install preformed or job formed inside corners.
 - 1. Preformed Corners: Install preformed corners before installing straight pieces.
 - 2. Job-Formed Corners: Use straight pieces of maximum lengths possible and form returns with not than 6 inches in length, miter corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

SECTION 096519
RESILIENT TILE FLOORING

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 Tile Flooring (Luxury Vinyl Tile).
- B. Related Sections:
 - 1. Division 06 Section "Underlayment."
 - 2. Division 09 Section "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
 - 1. Documentation of VOC content for adhesives.
 - 2. Documentation indicating resilient flooring complies with 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).
- B. Samples for Initial Selection: For each type of floor tile d.
- C. Product Schedule: For floor tile, use same designations indicated on Drawings.
- D. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 55 deg F or more than 85 deg F. Store floor tiles on flat surfaces.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 85 deg F, in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Maintain the relative humidity between 40% and 60% during installation.
- C. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 85 deg F.
- D. Close spaces to traffic during floor tile installation.
- E. Close spaces to traffic for 48 hours after floor tile installation.
- F. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Sustainability Requirements: Resilient tile flooring shall comply with the California Green Building Standards Code, 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).

2.2 RESILIENT VINYL FLOOR TILE (LUXURY VINYL TILE) RVT-1

- A. Solid Vinyl Floor Tile: Commercial grade luxury vinyl tile for glue down installation.

1. Basis of Design: Design, Drawings, and Specifications are based on Tarkett Company; Event+ Wood Collection.

- a. Tarkett North America

- 1) Subject to compliance with requirements, provide product indicated or submit request for substitution per Division 01 Section "Substitution Procedures."

2. Tile Standard: ASTM F 1700, Class III, Printed Film Vinyl Tile.
3. Type: B, Embossed Surface.
4. Wearing Surface: Embossed
5. Thickness/Wear Layer: 0.120 inch (3 mm) overall thickness.
6. Size: 6 inches by 48 inches nominal.
7. Colors and Patterns: Wood Crafted Plank, Provence 2131

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

1. Adhesives shall have a VOC content of not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Wood subfloors must have a minimum 18" (45.7 cm) of cross-ventilated space beneath the bottom of the joist.
1. The floor must be rigid, free of movement.
 2. Single wood and tongue and groove subfloors should be covered with ¼" (6.4 mm) APA approved underlayment plywood.
 - a. Do not install over OSB (Oriented Strand Board), particle board, chipboard, lauan or composite type underlayment's.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are same temperature as space where they are to be installed.
1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Luxury Vinyl Tile Flooring:
1. Install with manufacturer's adhesive specified for the site conditions and follow adhesive label for proper use.
 2. Follow Tarkett's recommendation for tile orientation.
 3. Open enough cartons of floor tiles to cover each area and mix tile to ensure shade variations do not occur within any one area.
 4. Roll the flooring in both directions using a 100 pound three-section roller.

- C. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
- D. Discard broken, cracked, chipped, or deformed tiles.
- E. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- F. Extend floor tiles into toe spaces, under accessible sink counters/cabinets, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
 - 1. No traffic for 24 hours after installation.
 - 2. No heavy traffic, rolling loads, or furniture placement for 48 hours after installation.
- D. Wait 48 hours after installation before performing initial cleaning.
- E. A regular maintenance program must be started after the initial cleaning.
- F. Cover floor tile until Substantial Completion.

END OF SECTION

SECTION 096816
CARPETING

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. Walk-off Mats and Tufted Carpet.

- B. Related Requirements:

- 1. Division 09 Section "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet.

1.3 ACTION SUBMITTALS

- A. Product Data: For carpet, adhesives, and accessory materials.

- 1. Carpet: For each type indicated, include manufacturer's written data on physical characteristics, durability, fade resistance, and installation recommendations for each type of substrate.
 - 2. Documentation of VOC content for adhesives.
 - 3. Documentation indicating carpet installed in the building interior meets 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).

- B. Shop Drawings: Show the following:

- 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
 - 2. Carpet type, color, and dye lot.
 - 3. Locations where dye lot changes occur.
 - 4. Seam locations, types, and methods.
 - 5. Type of subfloor.
 - 6. Type of installation.
 - 7. Pattern type, repeat size, location, direction, and starting point.
 - 8. Pile direction.

9. Type, color, and location of insets and borders.
 10. Type, color, and location of edge, transition, and other accessory strips.
 11. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet: 18-inch square Sample.
 2. Carpet Seam: 6-inch Sample.
 3. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long samples.
- D. Product Schedule: For carpet. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Test Reports: For carpet, for tests performed by a qualified testing agency.
- C. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 2. Precautions for cleaning materials and methods that could be detrimental to carpet.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.
 2. Provide usable scrap (carpet remnants 1 sq. yd. or larger in size.)

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced Installer who is certified by the International Certified Floorcovering Installers Association. All work shall be performed by a qualified and experienced mechanics working under the supervision of an experienced supervisor.
- B. Fire-Test-Response Ratings: Where indicated, provide carpet identical to those of assemblies tested for fire response per NFPA 253 by a qualified testing agency.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.

1.9 FIELD CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
- C. Do not install carpet over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.10 WARRANTY

- A. Special Warranty for Carpet and Walk-Off Mats: Manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge (more 3.0 kilovolts at a relative humidity of 20% and a room temperature of 70 degrees Fahrenheit), loss of face fiber, more than 10 percent loss of backing resiliency, 15 percent loss of pile fiber weight and delamination.
 - 3. Warranty Period: Limited Lifetime from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Sustainability Requirements: Carpet shall comply with 2022 California Green Building Standards Code, Section 5.504.4.4: 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).

2.2 CARPET WALK-OFF MATS (CPT-M)

- A. Basis-of-Design Product: Drawings and Specifications are based on the following:
 - 1. Tarkett; Abrasive Action II
 - 2. Or comparable product approved by the Architect and District.
- B. Installation Method: Adhesive.
- C. Physical Properties:
 - 1. Color: Charcoal 19100.
 - 2. Fiber Content: 100 percent nylon 6, 6.
 - 3. Fiber Type: TDX® Nylon.
 - 4. Pile Characteristic: Patterned-loop pile.
 - 5. Pile Height Average: 0.187 inch for finished carpet.
 - 6. Stitches: 8 stitches per inch.
 - 7. Gage: 1/12 gage in ends per inch.
 - 8. Face Weight: 24 oz./sq. yd.
 - 9. Total Weight: 85 oz./sq. yd. +/- 5 percent for finished carpet.
 - 10. Backing System: Tarkett; Powerbond® Cushion RS.
 - a. Cushion Weight: 35.5 oz/sq. yd per ASTM D-3574.
 - b. Cushion Density: 18.5 lbs/cu ft. per ASTM D-3574.
 - c. Cushion thickness: 0.156 inch per ASTM-D3574.
 - d. Compression Deflection: 7 Min. at 25 max ils/sq. inch at 25% per ASTM D-3574.
 - 11. Width: 6 feet.
 - 12. Applied Soil-Resistance Treatment: Eco-Ensure.
- D. Performance Characteristics: As follows:
 - 1. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
 - 2. Surface Flammability: Passes CPSC FF 1-70 per ASTM D-2859.
 - 3. Smoke Generation: Less than 450 per ASTM E-662
 - 4. Delamination: Not less than 4 lbf/in. per ASTM D 3936.
 - 5. Colorfastness to Light: Not less than 4 after 100 AFU (AATCC fading units) per AATCC 16, Option E.
 - 6. Electrostatic Propensity: 1.5 kV per AATCC 134.

2.3 TUFTED CARPET (CPT-1)

- A. Basis-of-Design Product: Drawings and Specifications are based on the following:
 - 1. Tarkett; Applause III.
 - 2. Or comparable product approved by the Architect and District.
- B. Installation Method: Peel and stick.
- C. Physical Properties:
 - 1. Color and Pattern: Night Light 28531
 - 2. Fiber Type: Dynex SD®/ Dynex ® Nylon.
 - 3. Pile Characteristic: Level-loop pile.
 - 4. Density Factor: 7,448 oz.cu yd.
 - 5. Pile Height Average: 0.117 inch for finished carpet.
 - 6. Stitches: 8.2 stitches per inch.
 - 7. Gage: 1/13 gage in ends per inch.
 - 8. Face Weight: 18 oz./sq. yd.
 - 9. Total Weight: 79 oz./sq. yd. +/- 5 percent for finished carpet.
 - 10. Backing System: Tarkett; Powerbond ® Cushion RS.
 - a. Cushion Weight: 35.5 oz/sq. yd per ASTM D-3574.
 - b. Cushion Density: 18.5 lbs/cu ft. per ASTM D-3574.
 - c. Cushion thickness: 0.156 inch per ASTM-D3574.
 - d. Compression Set: Max 10% per ASTM D-3574
 - e. Compression Deflection: 7 Min. at 25 max ils/sq. inch at 25% per ASTM D-3574.
 - 11. Width: 6 feet.
 - 12. Applied Soil-Resistance Treatment: Eco-Ensure.
- D. Performance Characteristics: As follows:
 - 1. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
 - 2. Surface Flammability: Passes CPSC FF 1-70 per ASTM D-2859.
 - 3. Smoke Generation: Less than 450 per ASTM E-662
 - 4. Delamination: Not less than 4 lbf/in. per ASTM D 3936.
 - 5. Colorfastness to Light: Not less than 4 after 100 AFU (AATCC fading units) per AATCC 16, Option E.
 - 6. Electrostatic Propensity: 2.2 kV per AATCC 134.

2.4 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.
- B. Adhesives (Walk-Off Mats): Water-resistant, mildew-resistant, nonstaining, pressure sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.

1. Adhesives shall have a VOC content of not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Adhesives (Tufted Carpet): Factory Installed Peel & Stick System
- D. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, pH range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.
- B. Concrete Slabs: Verify that finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Wood Subfloors: Verify the following:
1. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard" and with carpet manufacturer's written installation instructions for preparing substrates to ensure adhesion of flooring products.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 INSTALLATION

- A. Comply with CRI's "CRI Carpet Installation Standard and carpet manufacturer's written installation instructions for the following:
 - 1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9, "Direct Glue-Down Installation."
 - 2. Preapplied Adhesive Installation: Comply with CRI 104, Section 11.4, "Pre-Applied Adhesive Systems (Peel and Stick)."
- B. Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
- C. Do not bridge building expansion joints with carpet.
- D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

3.4 CLEANING AND PROTECTING

- A. Perform the following operations immediately after installing carpet:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove yarns that protrude from carpet surface.
 - 3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet to comply with CRI's "CRI Carpet Installation Standard."
- C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer and carpet adhesive manufacturer.

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.
- B. Related Sections include but are not limited to the following:
 - 1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
 - 2. Division 21 through 23 Sections for additional requirements for painting of plumbing and mechanical items.
 - 3. Division 26 through 28 Sections for additional requirements for painting of electrical items.
 - 4. Division 32 Section "Paving Specialties" for pavement markings.

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, switches, or control devices.

1.4 REFERENCES

- A. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of this Project Manual.

B. Referenced Standards:

1. ASTM D523 – Standard Test Method for Specular Gloss.
2. The Master Painters Institute, MPI Gloss and Sheen Levels.

1.5 QUALITY ASSURANCE

- A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with sufficient documented experience.
- B. 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.
- C. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
- D. Gloss Levels: Per Master Painters Institute (MPI) gloss standards “MPI Gloss and Sheen Levels,” measured in accordance with ASTM D523.

GLOSS LEVEL	DESCRIPTION	GLOSS AT 60 DEGREES ASTM D523	SHEEN AT 85 DEGREES ASTM D523
G1	A traditional matte finish – flat.	5 units, maximum	And 10 units, maximum
G2	A high side sheet flat – “a velvet-like finish”	10 units, maximum	And 10 – 35 units
G4	A “satin-like” finish	10-25 units	And 35 units maximum
G5	A traditional semi-gloss	35-70 units	-
G6	A traditional gloss	70-85 units	-
G7	A high gloss	More than 85 units	-

1.6 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 four brushout samples on 8 inch by 10 inch samples of actual material to be painted or stained.
 - 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.

1.7 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 50 deg F and a maximum of 90 degrees F, unless required otherwise by manufacturer's instructions.
 - 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.
4. Take precautionary measures to prevent fire hazards and spontaneous combustion.

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 50 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 50 degrees F for 24 hours before, during and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.
- D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior work and interior work, unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 foot candles measured mid-height at substrate surface.
- F. 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.
- G. 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.
- H. 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.

1.9 EXTRA STOCK

- A. Provide a new and unopened five-gallon container of each type, color and sheen to Owner.
- B. Label each container with color, in addition to the manufacturer's label.

PART 2 - PRODUCTS

2.1 PAINT 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.
 - 1. All paint materials shall be provided from a single manufacturer unless noted otherwise in this Section.
 - 2. Coatings: Ready mixed. Process pigments to a soft paste consistency capable of being readily and uniformly dispersed to a homogeneous coating. Good flow and brushing properties; capable of drying or curing free of streaks or sags.
 - 3. Accessory Materials: All other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.
 - 4. All Materials specified by brand name or manufacturer shall be delivered unopened at the job in their original containers.
- C. VOC Content: Paints and coatings applied at the Project site shall comply with VOC limits of authorities having jurisdiction and limits set by Rule 4601 of the San Joaquin Valley Air Pollution Control District ; 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. Anti-Corrosive and Anti-Rust Paints and Primers applied directly to Ferrous Metals: VOC
 13. content not more than 250 g/L.
 14. Clear Wood Finishes, Varnishes: VOC not more than 275 g/L.
 15. Clear Wood Finishes, Lacquers: VOC not more than 275 g/L.
 16. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.
 17. Varnish: VOC content not more than 450 g/L.
- D. Colors: Provide color selections made by the Architect. Colors shall be factory mixed and match approved samples.
- E. Chemical Component of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 2. Restricted Components: Paints and coatings shall not contain any of the following:
 - a. Acrolein.
 - b. Acrylonitrile.
 - c. Antimony.
 - d. Benzene.
 - e. Butyl benzyl phthalate.
 - f. Cadmium.
 - g. Di (2-ethylhexyl) phthalate.
 - h. Di-n-butyl phthalate.
 - i. Di-n-octyl phthalate.
 - j. 1, 2-dichlorobenzene.
 - k. Diethyl phthalate.
 - l. Dimethyl phthalate.
 - m. Ethylbenzene.
 - n. Formaldehyde.
 - o. Hexavalent chromium.
 - p. Isophorone.
 - q. Lead.
 - r. Mercury.
 - s. Methyl ethyl ketone.
 - t. Methyl isobutyl ketone.
 - u. Methylene chloride.
 - v. Naphthalene.
 - w. Toluene (methylbenzene).
 - x. 1,1,1-trichloroethane.
 - y. Vinyl chloride.

2.2 ACCEPTABLE MANUFACTURERS

- A. For Paint, Primer Sealers, Stain and Clear Finishes, refer to the Table at the end of this section.
- B. Substitutions: Under provisions of Section 012500.

2.3 FINISHES

- A. Refer to schedule at end of Section for surface finish schedule.

PART 3 - EXECUTION

3.1 GENERAL

Storage: All materials used by the painting contractor shall be stored and mixed in a place designated by the Owner or the Architect. The storage place must be kept neat and clean at all times. All cloths, waste or other material that might constitute a fire hazard shall be placed in a suitable metal container or shall be removed from the site or destroyed at the end of each day's work.

3.2 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Report any condition that may potentially affect proper application to the Architect, Architect's representative or inspector in writing. The Architect will cause such defect to be remedied.
- C. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Concrete: 10 percent.
 - 2. Masonry (Clay and CMU): 10 percent.
 - 3. Interior Located Wood: 15 percent.
 - 4. Exterior Located Wood: 7 percent.
 - 5. Portland Cement Plaster: 12 percent.
 - 6. Gypsum Board: 12 percent.
- D. Portland Cement Plaster Substrates: Verify that plaster is fully cured.
- E. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

- F. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- G. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.
- H. 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.

3.3 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, switches, or control devices unless otherwise indicated on Electrical Drawings.
 - a. Contractor may be subject to additional costs due to unauthorized removal of items, refer to Part 1 Article "Special Requirements."
 - 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 more than 1/16 inch wide and defects at concrete and masonry surfaces shall be filled with cement grout; match surface texture. Form oils or separating agents that might impair the adhesion, or the appearance of the specified finish shall be removed before any materials are applied.
 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. Stucco: Plaster work that has cured for less than two months and all other plaster areas that show the presence of excessive amounts of free alkali when tested with phenolphthalein or some other suitable means shall be treated with a zinc sulfate wash (3 lbs. per gallon of water) to neutralize the alkali and obtain the optimum of surface carbonation.
1. All surface Cracks greater than 1/32 inch wide, holes and other surface defects shall be repaired as recommended by the finish paint manufacturer's written instructions.
- F. 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."
- G. 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.
- H. 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.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. 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, back prime with spar varnish.
 - b. Back prime 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.
 5. Interior Wood Items Scheduled to Receive Finish: Hand sandpaper and wipe off dust and grit prior to priming. Seal knots, pitch streaks and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.
 - a. At woodwork with transparent finish, nail holes, cracks or defects shall be filled with wood filler tinted to match color of stain.
- K. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.
- L. 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.
- M. Drywall: Fill any cracks or defects with drywall joint compound. Latex fill minor defects. Sand any rough spots smooth. Spot-prime defects after repair. Do not raise nap on paper covering.

3.4 WORKMANSHIP

- A. All work shall be performed by experienced mechanics in a skillful manner. All materials shall be evenly applied so as to be free from sags, crawls or other defects. Coats shall be of the proper consistency and well brushed out as to show the minimum brush marks, except varnish and enamel which shall be uniformly applied. Brushes shall be clean and in good condition. All areas with a transparent coat will be repainted at contractor's expense.
- B. All painting shall be by brush, except plaster and gypsum board which may be by spraying with back rolling. Underside of soffits, covered walks, acoustical panels and screens may be completed by spraying with back rolling.
- C. No work shall be completed under conditions that are unsuitable for the production of good results. No painting shall be completed while plaster is curing, or while wood sawing, sanding or cleaning is in process. Coats shall be thoroughly dry before the succeeding coat is applied. Finishes shall be uniform as to sheen, shine, color and texture, except when glazing is required.
- D. No exterior painting shall be done in rainy, damp, or frosty weather. No Interior painting or finishing shall be permitted until the building has been thoroughly dried out by artificial heat. A minimum temperature of 50 degrees Fahrenheit shall be maintained in areas where the application or drying of paint is occurring.

- E. This contractor shall take into account that not less than the following percentages of total surfaces shall be painted in deep (dark) tones of color selected: (This includes colors requiring ultra-deep bases).

- | | |
|---------------------------|------|
| 1. Walls: | 25% |
| 2. Ceilings: | 25% |
| 3. Doors and Door Frames: | 100% |
| 4. Sheet Metal | 50% |
| 5. Exposed Steel: | 100% |

3.5 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. Tint undercoats same color as topcoat but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. 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.
- E. 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.
- F. 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.
- G. 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.
- H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

- I. 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.
- J. 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.
- K. 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.
- L. 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.
- M. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.
- N. Mechanical and Electrical Equipment:
 - 1. See Divisions 21-25 and 25-25 for other items requiring painting.
 - 2. Paint interior surfaces of air ducts and convector heating cabinets that are visible through grilles and louvers with one) coat of flat black paint, to limit of sight line. Paint dampers exposed behind grilles to match face panels. Paint all new interior and exterior exposed ductwork and ductwork supports. Paint all new conduit, pipes and conduit/pipe supports in exposed interior and exterior locations.
 - 3. Reinstall electrical plates, hardware, light fixture trim, and fittings removed for surface preparation or painting.
 - 4. Do not paint factory-finished mechanical and electrical equipment.
- O. 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.
 - b. Equipment, including panelboards.
 - c. Uninsulated metal piping.
 - d. Uninsulated plastic piping.
 - e. Pipe hangers and supports.
 - f. Metal conduit.
 - g. Plastic conduit.
 - h. Tanks that do not have factory-applied final finishes.
 - i. Ducts, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

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. Equipment, including panelboards.
- b. Uninsulated metal piping.
- c. Uninsulated plastic piping.
- d. Pipe hangers and supports.
- e. Metal conduit.
- f. Plastic conduit.
- g. Tanks that do not have factory-applied final finishes.

3.6 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.

3.7 PAINT SCHEDULE – EXTERIOR SURFACES

- A. Ferrous Metal
 - 1st coat – Acrylic Low Sheen Primer
 - 2nd and 3rd coats – 100 percent Acrylic Semi-Gloss
- B. Ferrous Metal (Industrial)
 - 1st coat – Epoxy Primer
 - 2nd and 3rd coats – Aliphatic Urethane Gloss Enamel
 - For use at exterior metal architectural features/exposed structure
- C. Galvanized Metal (Handrail and Guardrail Assemblies only)
 - 1st coat – Etch Prep
 - 2nd coat – Epoxy Satin Primer
 - 3rd and 4th coats – High Dispersion Pure Acrylic Polymer
- D. Galvanized Metal and Aluminum (Except Handrail and Guardrail Assemblies)
 - 1st coat – Etch Prep
 - 2nd coat – Acrylic Low Sheen Primer
 - 3rd and 4th coats – 100 percent Acrylic Semi-Gloss
- E. Exposed Concrete and Cement Plaster System with Cementitious Finish Coat
 - 1st coat – Acrylic Flat Primer
 - 2nd and 3rd coats – Elastomeric Flat
- F. Cement Plaster System with Acrylic Finish Coat
 - 1st coat – Acrylic Flat Primer
 - 2nd and 3rd coats – Elastomeric Flat
- G. Wood
 - 1st coat – Acrylic Flat Primer
 - 2nd and 3rd coats – 100 percent Acrylic Flat
- H. Wood
 - 1st coat – Acrylic Flat Primer
 - 2nd and 3rd coats – 100 percent Acrylic Semi-Gloss

- I. Pressure Treated Wood
1st coat – Acrylic Flat Primer
2nd and 3rd coats – 100 percent Acrylic Satin
- J. Masonry (CMU)
1st coat – Acrylic Block Filler Primer
2nd and 3rd coats – Elastomeric Flat

3.8 PAINTING SCHEDULE – INTERIOR SURFACES:

- A. Gypsum Board
1st coat – PVA Primer Sealer
Texture by Section 09 29 00 Contractor
2nd coat – PVA Primer Sealer – Tint towards final color.
3rd and 4th coats – 100 percent Acrylic Semi-Gloss
- B. Interior Cement Plaster
1st coat – PVA Primer Sealer
2nd coat and 3rd coats – 100 percent Acrylic Semi-Gloss Enamel
- C. Gypsum Board (Whiteboard Finish)
1st coat – PVA Primer Sealer
Texture by Section 09 29 00 Contractor (Level 5)
2nd coat – Acrylic Flat Primer
3rd coat – 2-Part Solvent Based Dry-Erase Coating
- D. Wood (Opaque Finish)
1st coat – Acrylic Flat Primer – Tint towards final color.
2nd coat and 3rd coats – 100 percent Acrylic Semi-Gloss
- E. Interior Ferrous Metal
1st coat – Acrylic Low Sheen Primer – Tint towards final color.
2nd coat and 3rd coats – 100 percent Acrylic Semi-Gloss Enamel
Typical paint system at all hollow metal doors, pressed metal frames, and exposed steel structure.
- F. Concrete
1st coat – Acrylic Flat Primer – Tint towards final color
2nd coat and 3rd coats – 100 percent Acrylic Semi-Gloss
- G. Masonry (CMU)
1st coat – Acrylic Block Filler Primer
2nd coat and 3rd coats – 100 percent Acrylic Semi-Gloss
- H. Wood (Transparent Finish)
1st coat – Oil-based Interior Wood Stain
2nd coat – Oil-based Interior Sanding Sealer
3rd and 4th coats – Oil-based Interior Wood Varnish – Semi-Gloss

- I. Galvanized Metal, Zinc Alloy Metal and Aluminum
 - 1st coat – Etch Prep
 - 2nd coat – Acrylic Low Sheen Primer – Tint towards final color.
 - 2nd coat and 3rd coats – 100 percent Acrylic Semi-Gloss Enamel

3.9 PAINT TABLE SCHEDULE

APPLICATION	TYPE	MPI GLOSS LEVEL	MANUFACTURER	PRODUCT NUMBER
PRIMERS				
Exterior Ferrous Metal	Acrylic	G2	Kelly-Moore	5725
Exterior Ferrous Metal (Industrial)	Epoxy	G6	Rust-oleum	9103
Exterior Galvanized Metal and Aluminum (Except Handrail and Guardrail Assemblies)	Acrylic	G2	Kelly-Moore	5725
Exterior Galvanized Metal (Handrail and Guardrail Assemblies Only)	Epoxy	G4	Tnemec	L69
Exterior Wood and Pressure Treated Wood	Acrylic	G1	Kelly-Moore	255
Exterior Cement Plaster and Concrete; and Interior Concrete	Acrylic	G1	Kelly-Moore	247
Exterior Cement Plaster System with Acrylic Finish Coat	Acrylic	G1	Kelly-Moore	250
Exterior and Interior Masonry (Block Filler)	Acrylic	G1	Kelly-Moore	521
Interior Gypsum Board & Cement Plaster	PVA	G1	Kelly-Moore	971
Interior Wood	Acrylic	G1	Kelly-Moore	973
Interior Ferrous Metal	Acrylic	G2	Kelly-Moore	5725
Interior Aluminum, Ferrous & Galvanized Metal	Acrylic	G2	Kelly-Moore	5725
Interior Gypsum Board (Dry-Erase)	Acrylic	G1	Kilz	Premium Primer

APPLICATION	TYPE	MPI GLOSS LEVEL	MANUFACTURER	PRODUCT NUMBER
FINISHES				
Exterior Ferrous & Galvanized Metal, Aluminum, Wood and Pressure Treated Wood (Except Handrail and Guardrail Assemblies)	100 percent Acrylic	G5	Kelly-Moore	1250
Exterior Ferrous Metal (Industrial)	Aliphatic Urethane Enamel	G6	Rust-oleum	3300
Exterior Galvanized Metal (Handrail and Guardrail Assemblies Only)	High Dispersion Pure Acrylic	G5	Tnemec	1029
Exterior Cement Plaster, Concrete, and CMU	Elastomeric	G1	Kelly-Moore	1128
Exterior Wood and Masonry	100 percent Acrylic	G1	Kelly-Moore	1240A
Exterior Pressure Treated Wood	100 percent Acrylic	G4	Kelly-Moore	1245A
Interior Gypsum Board, Wood, Masonry (CMU) and Concrete	100 percent Acrylic	G5	Kelly-Moore	1650
Interior Gypsum Board (Dry-Erase Finish)	2-Part Solvent		FUZE	WHITE
Interior Ferrous & Galvanized Metal and Aluminum	100 percent Acrylic Enamel	G5	Kelly-Moore	1685
Interior Plaster (existing and new)	100 percent Acrylic Enamel	G5	Kelly-Moore	1685
MISCELLANEOUS				
Interior Wood Stain	Oil-based	G1	Old Masters	11101
Interior Sanding Sealer	Oil-based	G1	Old Masters	45004
Interior Wood Varnish	Oil-based Polyurethane Semi-Gloss Finish	G5	Old Masters	495
Exterior Heavy-Duty Cleaner	Water Based	-	Jasco	Prep & Prime
Exterior & Interior Galvanized Metal Etch Prep.	Water Based	-	Jasco	Prep & Prime

END OF SECTION

SECTION 101400 SIGNAGE

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. Interior and exterior panel signs for room or space identification.

- B. Related Sections:

- 1. Division 01 Section "Temporary Facilities and Controls" for Project identification signage.
 - 2. Division 10 Section "Dimensional Sign Characters" for individual character signs.
 - 3. Division 22, 23, and 26 Sections as applicable to Plumbing, Mechanical, and Electrical Work for tags and nameplates for equipment.
 - 4. Division 32 Section "Paving Specialties" for parking lot and pedestrian signage.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data including construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.
- B. Shop Drawings: Include plans, elevations, and full-scale template layout of characters and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
 - 1. Provide message list for each sign, including large-scale details of wording, lettering, and Braille layout.
- C. Schedule: Schedule indicating sign locations, type, other pertinent data, and referenced to rooms or doors with the same referencing as used on the Drawings.
- D. Braille Text Certification: Provide certification from the sign manufacturer that Braille text complies with regulatory requirements indicated (Contracted (Grade 2) per CBC Section 11B-703.3).
- E. Braille Text Translation Confirmation: Provide confirmation of Braille text translations.

- F. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for each type of sign and material indicated.
- G. Samples for Verification: Provide 2 full size sample signs showing edge and corner condition, border, text characters of height specified, Braille text, and selected colors, of each type of sign indicated. Sample will be retained by Architect.
- H. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each sign type through one source from a single manufacturer.

1.5 FIELD CONDITIONS

- A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.6 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer agrees to replace signs that fail in materials or workmanship within specified warranty period.
 - 1. Damage from deliberate destruction and vandalism is excluded.
 - 2. Warranty Period for Interior Signs: Building lifetime.
 - 3. Warranty Period for Exterior Signs: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 REGULATORY REQUIREMENTS FOR SIGNS

- A. Regulatory Requirements: Comply with requirements of the following:
 - 1. 2010 ADA Standards for Accessible Design.
 - 2. ANSI A117.1.
 - 3. California Building Code, Sections 11B-216 and 11B-703.

- B. Room or Space Identification Signs, CBC 11B-216.2: Where provided, signs identifying permanent rooms and spaces shall comply with CBC Sections 11B-703.1, 11B-703.2, 11B-703.3, and 11B-703.5. Where pictograms are provided as designations of permanent rooms and spaces, the pictograms shall comply with CBC Section 11B-703.6 and shall have text descriptors complying with CBC Sections 11B-703.2 and 11B-703.5. Exterior signs that are not located at the door to the space they serve shall not be required to comply with CBC Section 11B-703.2.
- C. Directional and Informational Signs, CBC 11B-216.3: Signs that provide direction to or information about spaces and facilities shall comply with CBC Section 11B-703.5.
- D. Means of Egress Signs, CBC 11B-216.4: Tactile exit signs required by CBC Section 1013.4 at doors to exit passageways, exit discharge, and exit stairways shall comply with CBC Sections 11B-703.1, 11B-703.2, 11B-703.3, and 11B-703.5.
- E. Inspection, CBC 11B-703.1.1.2: Signs and identification devices shall be field inspected after installation and approved by the enforcing agency prior to the issuance of a final certificate of occupancy per Chapter 1, Division II, Section 111, or final approval where no certificate of occupancy is issued. The inspection shall include, but not be limited to, verification that Braille dots and cells are properly spaced and the size, proportion and type of raised characters are in compliance with the regulations of CBC Section 11B-703.
- F. Raised Characters, CBC 11B-703.2: Raised characters shall comply with CBC Section 11B-703.2 and shall be duplicated in Braille complying with CBC Section 11B-703.3. Raised characters shall be installed in accordance with CBC 11B-703.4.
 - 1. Depth: Raised characters shall be raised 1/32-inch minimum above their background.
 - 2. Case: Raised characters shall be upper case.
 - 3. Style: Raised characters shall be sans serif. Characters shall not be italic, oblique, script, highly decorative, or other unusual forms.
 - 4. Character Proportions: Raised characters (Text) on signs shall be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the uppercase letter "I".
 - 5. Character Height: Character height measured vertically from the baseline of the character shall be of 5/8-inch minimum and 2-inches maximum based on the height of the uppercase letter "I".
 - 6. Stroke Thickness: Stroke thickness of the uppercase letter "I" shall be 15 percent maximum of the height of the character.
 - 7. Character Spacing: Character spacing shall be measured between the two closest points of adjacent raised characters within a message, excluding word spaces. Where characters have rectangular cross sections, spacing between individual raised characters shall be 1/8 inch minimum and 4 times the raised character stroke width maximum. Where characters have other cross sections, spacing between individual raised characters shall be 1/16 inch minimum and 4 times the raised character stroke width maximum at the base of the cross sections, and 1/8 inch minimum and 4 times the raised character stroke width maximum at the top of the cross sections. Characters shall be separated from raised borders and decorative elements 3/8 inch minimum.

8. Line Spacing: Spacing between the baselines of separate lines of raised characters within a message shall be 135 percent minimum and 170 percent maximum of the raised character height.
 9. Format: Text shall be in a horizontal format.
 10. Finish and Contrast: Characters and their background shall have a non-glare finish. Characters shall contrast with their background with either light characters on a dark background or dark characters on a light background. Requirement applies to all signs.
- G. Braille, CBC 11B-703.3: Braille shall be contracted (Grade 2) and shall comply with CBC Sections 11B-703.3 and 11B-703.4.
1. Dimensions and Capitalization (CBC 11B-703.3.1): Braille dots shall have a domed or rounded shape and shall comply with CBC Table 11B-703.3.1. The indication of an uppercase letter or letters shall only be used before the first word of sentences, proper nouns and names, individual letters of the alphabet, initials, and acronyms. Braille dot physical requirements shall be per CBC Table 11B-703.3.1 as indicated below; dimensions for distances are measured from center to center of Braille dots:
 - a. Dot Base Diameter: 0.059 inch minimum, 0.063 inch maximum.
 - b. Distance between Two Dots in the same Cell: 0.100 inches.
 - c. Distance between corresponding Dots in adjacent Cells: 0.300 inches.
 - d. Dot Height: 0.025 inch minimum, 0.037 inch maximum.
 - e. Distance between corresponding Dots from one cell directly below: 0.395 inch minimum, 0.400 inch maximum.
 2. Position (CBC 11B-703.3.2): Braille shall be positioned below the corresponding text in a horizontal format, flush left, or centered. If text is multi-lined, Braille shall be placed below the entire text. Braille shall be separated 3/8 inch minimum and 1/2 inch maximum from any other tactile characters and 3/8 inch minimum and from raised borders and decorative elements.
- H. Sign Installation Height and Location, CBC 11B-703.4:
1. Height Above Ground or Floor: Tactile characters on signs shall be located 48 inches minimum above the finish floor or ground surface, measured from the baseline of the lowest Braille cells and 60 inches maximum above the finish floor or ground surface, measured from the baseline of the highest line of raised characters.

2. Location: Where a tactile sign is provided at a door, the sign shall be located alongside the door at the latch side. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located on the inactive leaf. Where a tactile sign is provided at double doors with two active leaves, the sign shall be located to the right of the right hand door. Where there is no wall space at the latch side of a single door or at the right side of double doors, signs shall be located on the nearest adjacent wall. Signs containing tactile characters shall be located so that a clear floor space of 18 inches minimum by 18 inches minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position. Where provided, signs identifying permanent rooms and spaces shall be located at the entrance to, and outside of the room or space. Where provided, signs identifying exits shall be located at the exit door when approached in the direction of egress travel.
- I. Visual Characters, CBC 11B-703.5: Visual characters are considered to be intended for signage that is not accompanied by Braille. (The requirements of this Section do not apply to room identification signage).
1. Finish and Contrast: Characters and their background shall have a non-glare finish. Characters shall contrast with their background with either light characters on a dark background or dark characters on a light background. Requirement applies to all signs.
 2. Case: Characters shall be upper case or lower case or a combination of both.
 3. Style: Characters shall be conventional in style. Characters shall not be italic, oblique, script, highly decorative, or other unusual forms.
 4. Character Proportions: Characters shall be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the uppercase letter "I".
 5. Character Height: Minimum character height shall be based on the uppercase letter "I" and shall comply with CBC Table 11B-703.5.5 as follows:
 - a. Height of baseline of character from finish floor:
 - 1) 40 inches minimum to less than or equal to 70 inches with a horizontal viewing distance of:
 - a) Less than 72 inches: Minimum character height to be 5/8 inch.
 - b) 72 inches and Greater: Minimum character height to be 5/8 inch plus 1/8 inch for each foot of viewing distance beyond 72 inches.
 - 2) Greater than 70 inches to less than or equal to 120 inches with a horizontal viewing distance of:
 - a) Less than 180 inches: Minimum character height to be 2 inches.
 - b) 180 inches and Greater: Minimum character height to be 2 inches plus 1/8 inch for each foot of viewing distance beyond 180 inches.

- 3) Greater than 120 inches, with a horizontal viewing distance of:
 - a) Less than 21 feet: Minimum character height to be 3 inches.
 - b) 21 feet and Greater: Minimum character height to be 3 inches plus 1/8 inch for each foot of viewing distance beyond 21 feet.
6. Height from Finish Floor or Ground: Visual characters shall be 40 inches minimum above the finish floor or ground measured to the baseline of the character.
7. Stroke Thickness: Stroke thickness of the uppercase letter "I" shall be 10 percent minimum and 20 percent maximum of the height of the character.
8. Character Spacing: Character spacing shall be measured between the two closest points of adjacent raised characters, excluding word spaces. Spaces between individual characters shall be 10 percent minimum and 35 percent maximum of character height.
9. Line Spacing: Spacing between the baselines of separate lines of characters within a message shall be 135 percent minimum and 170 percent maximum of the raised character height.
10. Format: Text shall be in a horizontal format.

J. Pictograms, CBC 11B-703.6:

1. Pictogram Field: Pictograms shall have a field height of 6 inches minimum. Characters and Braille shall not be located in the pictogram field.
2. Finish and Contrast: Pictograms and their field shall have a non-glare finish. Pictograms shall contrast with their field with either a light pictogram on a dark field or a dark pictogram on a light field.
3. Text Descriptors: Pictograms shall have text descriptors located directly below the pictogram field. Text descriptors shall comply with CBC Sections 11B-703.2, 11B-703.3, and 11B-703.4.

K. Symbols of Accessibility, CBC 11B-703.7:

1. Finish and Contrast: Symbols of accessibility and their background shall have a non-glare finish. Symbols of accessibility shall contrast with their background with either a light symbol on a dark background or a dark symbol on a light background.
2. Symbols:
 - a. International Symbol of Accessibility (ISA): ISA symbols shall comply with CBC Figure 11B-703.7.2.1. The symbol shall consist of a white figure on a blue background. The blue shall be Color No. 15090 in Federal Standard 595C.
 - b. International Symbol of Teletypewriter (TTY): The International Symbol of Teletypewriter (TTY) shall comply with CBC Figure 11B-703.7.2.2.
 - c. Volume Control Telephones: Telephones with a volume control shall be identified with a pictogram complying with CBC Figure 11B-703.7.2.3.
 - d. Assistive Listening Systems: Assistive listening systems shall be identified by the International Symbol of Access for Hearing loss complying with CBC Figure 11B-703.7.2.4.

- e. Toilet and Bathing Facilities, Geometric Symbols: Doorways leading to toilet and bathing rooms shall be identified by a geometric symbol complying with CBC Section 11B-703.7.2.6. The symbol shall be mounted at 58 inches minimum and 60 inches maximum above the finish floor measured from the centerline of the symbol. Where a door is provided, the symbol shall be mounted within 1 inch of the vertical centerline of the door.
 - 1) Men's Toilet and Bathing Facilities: Men's toilet and bathing facilities shall be identified by an equilateral triangle, 1/4 inch thick, with edges 12 inches long and a vertex pointing upward. The triangle symbol shall contrast with the door, either light on dark background or dark on a light background.
 - 2) Women's Toilet and Bathing Facilities: Women's toilet and bathing facilities shall be identified by a circle, 1/4 inch thick and 12 inches in diameter. The circle symbol shall contrast with the door, either light on dark background or dark on a light background.
 - 3) Unisex Toilet and Bathing Facilities: Unisex toilet and bathing facilities shall be identified by a circle, 1/4 inch thick and 12 inches in diameter with a 1/4 inch thick triangle with a vertex pointing upward superimposed on the circle and within the 12 inch diameter. The triangle symbol shall contrast with the circle symbol, either light on dark background or dark on a light background, the circle symbol shall contrast with the door, either light on dark background or dark on a light background.
 - 4) Edges and Corners: Edges of geometric symbols shall be rounded, chamfered, or eased. Corners of geometric symbols shall have a minimum radius of 1/8 inch.

2.2 MANUFACTURERS

- A. Manufacturers, Basis-of-Design Products: In other Articles where named manufacturer's products are indicated, Drawings and Specifications are based on products manufactured by:

- 1. Best Sign Systems Inc.

- a. Subject to compliance with requirements, provide products indicated or comparable products by one of the following:
 - 1) ASI-Modulex, Inc.
 - 2) Gemini Incorporated.

2.3 PANEL SIGNS

- A. General: Provide smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch measured diagonally from corner to corner complying with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

- B. Design Requirements: Panel signs shall comply with Part 2 Article "Regulatory Requirements for Signs."
- C. Scheduled Signs: Provide signs as indicated on Drawings and as scheduled in Part 3 Article "Sign Schedule."
- D. Interior Panel Signs: Basis of Design: Best Sign Systems, Inc., HC 300 Series signs complying with the following requirements:
 - 1. Material: Best Sign Systems Inc., MP Plastic, phenolic-backed melamine plastic laminate faced sheet, 0.25-inch thick.
 - 2. Edge Condition: Beveled.
 - 3. Corner Condition: Rounded to radius of 1/2 inch.
 - 4. Border: 3/8-inch wide.
 - 5. Text Font: Standard Medium.
 - 6. Text Height: As indicated on Drawings.
 - 7. Mounting: Unframed, wall mounted.
 - 8. Color: As selected by Architect from manufacturer's full range, text and border shall contrast with background.
- E. Exterior Panel Signs: Basis of Design: Best Sign Systems, Inc., HC 300 Series signs complying with the following requirements:
 - 1. Material: Fiberglass Sheet, 0.25-inch thick.
 - 2. Edge Condition: Beveled.
 - 3. Corner Condition: Rounded to radius of 1/2 inch.
 - 4. Border: 3/8-inch wide.
 - 5. Text Font: Standard Medium
 - 6. Text Height: As indicated on Drawings.
 - 7. Mounting: Unframed, wall mounted.
 - 8. Color: As selected by Architect from manufacturer's full range, text and border shall contrast with background.
- F. Sign Backs/Blanks: Provide matching sign blanks for signs mounted to transparent and/or semi-transparent glazed surfaces to conceal exposed sign backs.
 - 1. Where sign backs/blanks are located within the interior of the building, signs shall be of the same material as other interior signs.
 - 2. Where sign backs/blanks are located on the exterior of the building, signs shall be of the same material as other exterior signs.
 - 3. Profile and size of sign backs/blanks shall match that of the sign backs that are to be concealed.

2.4 ACCESSORIES

- A. Mechanical Fasteners: Use tamper resistant fasteners fabricated from materials that are not corrosive to sign material and mounting surface.
- B. Adhesives: As recommended by sign manufacturer and with a VOC content of 70 g/L or less for adhesives used inside the weatherproofing system and applied on-site when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

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 work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.
 - 1. Install signs level, plumb, and with sign surfaces free from distortion and other defects in appearance.
 - 2. Install signs at locations required by regulatory requirements, as indicated on the Drawings, and per this Specification section.
- B. Height: Install signs at heights indicated on Drawings and to comply with regulatory requirements indicated in Part 2 Article "Regulatory Requirements for Signs" of this specification Section.
 - 1. Sign mounting height shall be consistent for the Project.
- C. Location Relative to Door Openings: Install signs relative to door openings as indicated on Drawings and to comply with regulatory requirements indicated in Part 2 Article "Regulatory Requirements for Signs" of this specification Section.
 - 1. Sign location relative to door openings shall be consistent for the Project.

D. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:

1. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces that cannot be drilled or screwed. Do not use this method for vinyl-covered or rough surfaces.
2. Silicone-Adhesive Mounting: Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.
3. Mechanical Fasteners: Use non-removable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
4. Where panel signs are mounted on glass, provide matching plate on opposite side of glass to conceal mounting materials.

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.
- B. Clean per manufacturer's recommendation prior to final inspection.

3.4 SIGN SCHEDULE

- A. Interior Room Identification Signs: Provide interior room identification signage adjacent to doors as indicated and scheduled on the Drawings.
 1. Text Content: Identify rooms by number and name unless otherwise indicated. Room names and numbering shall comply with Owner's instructions (not Architect's referencing or numbering as indicated on the Drawings).
 2. Text Height: As indicated on Drawings and in compliance with referenced CBC and ADA requirements.
 3. Sign Size: As indicated on drawings.
- B. Tactile Exit Signs: Provide tactile exit signs at locations indicated on Drawings, as required to comply with regulatory requirements, and as follows:
 1. Exterior Doors: Each grade level exterior exit door from a room or space having an illuminated exit sign shall be identified by a tactile exit sign with the word "EXIT".
 2. Interior Rooms to Exits: Each exit door to a corridor, exit enclosure, or exit passageway, from a room having an illuminated exit sign shall be identified by a tactile exit sign with the words "EXIT ROUTE".
- C. Toilet Room Identification Signs: Signage shall consist of door mounted geometric symbols and wall mounted identification signs to comply with regulatory requirements and as indicated on the Drawings.

- D. Exterior Room/Space Identification Signs: Provide exterior identification signage at exterior public access doors to each usable or occupied space of the building.
1. Text Content: Identify building areas by functional use. Text content shall comply with Owner's instructions.
 2. Text Height: As indicated on Drawings and in compliance with referenced CBC and ADA requirements.
 3. Sign Size: As indicated on drawings.

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. Portable hand carried multi-purpose dry chemical ABC rated 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.
- A. Multipurpose Dry-Chemical ABC Extinguisher: UL-rated, 5-lb, 2-A:10B:C, 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 MOUNTING BRACKETS

- A. Mounting Brackets: Fire extinguisher manufacturer's standard galvanized steel bracket designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with red and black baked-enamel finish.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.

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 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, signal, and fire alarm systems in place and the installation of new electrical, signal, and fire alarm 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
262213	Transformers
265113	Lighting
269500	Electrical Acceptance Tests
270000	Communications, Paging, & Signal Control
270528	Pathways for Communications Systems
271300	Communications Backbone Cabling
271500	Communication Horizontal Cabling
283100	Fire Alarm/Emergency Voice Alarm Communications 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 2022 California Electrical Code 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. Electrical Distribution:
 - a. Power distribution system, as shown.
 - b. Trenching, conduits and feeders for electrical power including connections to relocatable buildings.
 2. Grounding
 - a. Grounding system including installations of ground rods, as shown. Connections to water and/or gas piping and building steel.
 - b. Provide the following grounding electrodes at each building, bonded together to form the grounding electrode system:
 - 1) Metal underground water pipe in direct contact with the earth for ten feet or more and electrically continuous to the points of connection of the grounding electrode conductor and the bonding conductors.
 - 2) The metal frame of the building, where effectively grounded.
 - 3) Ground rod of copper clad steel, minimum $\frac{3}{4}$ inch diameter, minimum 10 feet long, driven full length into the earth. If a maximum resistance to ground of 5 ohms cannot be obtained with a single ground rod, provide additional ground rods installed not closer than 6 feet apart until a maximum resistance to ground of 5 ohms is obtained.
 - c. Bonding of adjacent modular buildings.
 - d. Testing of grounding system as outlined in Section 269500.
 3. Signal Distribution:
 - a. Trenching, conduits and conductors for signal systems including connections to relocatable buildings.
 - b. Building mounted conduits and conductors for signal systems including connections to relocatable buildings.
 - c. Trenching and conduits for control systems as required by Divisions 21-25 Specification Sections.
 4. Lighting:
 - a. Provide complete lighting system including fixtures, hangers, lamps, and lighting controls.
 - b. Provide complete Lighting Control System consisting of timer switches and other controls as shown in Drawings.

5. Data Distribution System
 - a. Extension of existing Data system.
 - b. Extension of existing Telephone system.
6. 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 system.
 - c. Remove, extend and re-install Fire Alarm devices as shown on Drawings.
7. Intercommunications, Clock and Program System:
 - a. Extension of existing Intercommunications system.
 - b. Extension of existing Master Clock system.
 - c. Provide additional Exterior Speakers as shown on Drawings.
8. 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.
9. Equipment Connections
 - a. Provide equipment connections and coordination in accordance with manufacturer's recommendations and product submittals.
- E. Products supplied by Owner (or others, as noted) and installed by Contractor under this Section.
 1. None.
- F. Products supplied by Contractor but not installed under this Section.
 1. None.
- G. Work specifically **excluded** from this Division.
 1. Furnishing of motors.
- H. The following Sections contain requirements that relate to this Section:
 1. None
- I. It shall be understood that the existing conduit with its wiring is presently active (hot), in operation with its pertinent equipment.
- J. 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.

- K. 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.
- L. 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.
- M. 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.
- N. Furnish, install and connect all above grade grounding materials and make above ground connections of underground cables to equipment and/or structural steel as shown on the construction drawings and as required by code.
- O. Size, furnish, install and connect new conduit, conduit fittings, and seal fittings, expansion fittings and supports. This includes above grade as well as underground.
- P. Size, furnish, and install junction, pull and terminal boxes, in accordance to code requirements and as shown on the construction drawings.
- Q. 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.
- R. 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.
- S. 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.
- T. Furnish, install and connect all power, control and instrumentation cable, including all necessary cable lugs, connectors and terminations.
- U. Perform all testing per the Specifications (including generator cables) and report to Owner's field representative in a timely manner so as not to impede the scheduled completion of the Contract.
- V. Prime paint all uncoated carbon steel items furnished by Contractor.
- W. Energize low voltage services after testing equipment and wiring in accordance with manufacturer instructions and specifications.
- X. Electrical contractor shall coordinate with the utility and the facility personnel to schedule an outage to terminate cables at the main bus in the existing main switchboard.

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 current rules and regulations of all applicable codes. 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.
 - 5. Local Codes.
- 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 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.

1.6 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.

1.7 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.

1.8 SUBMITTALS

- A. Shop Drawings and Product Data
 - 1. All **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.

B. 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.

C. Substitutions

1. **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.

D. Record Drawings

1. See Specification Section 017839, PROJECT RECORD DOCUMENTS, for additional information and requirements.
2. In addition to the provisions of Specification Section 017839, PROJECT RECORD DOCUMENTS, **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.

E. Operations and Maintenance Instructions

1. See Specification Section 017823, OPERATION AND MAINTENANCE DATA, for additional information and requirements.
2. In addition to the provisions of Specification Section 017823, OPERATION AND MAINTENANCE DATA **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.

1.9 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.

1.10 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.

1.11 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

- 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, 3500PSI 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 $\frac{3}{4}$ " chamfer. The base shall have #4 reinforcing bars at 12" on center, each way, located at the mid-depth of the base.
- C. 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.
- D. 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.
 - 1) 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 Structural Engineer. The project inspector will verify that all components and equipment have been anchored in accordance with above requirements.

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 AND PULL BOXES

- 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 3500-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. 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.

- D. 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 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. "Flash Guards" are not permitted to be used as box extensions.
- C. Approved manufacturers of metal boxes are Circle AW, Crouse-Hinds, Steel City or equal.
- D. 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. Receptacles for Owner-furnished equipment shall match that equipment's plug configuration.
 - 4. Other Receptacles: Other receptacles shall match the plug configuration and ratings required for the utilization equipment that is served.
- E. 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 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.

2.8 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. 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.

2.9 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

- 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 in relation to the conduit grade or ground cover requirements as designated in the plans.

- B. Sealants used between the joints of the pullbox 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 shall have seals to prevent water from entering the raceway.

3.3 RACEWAY APPLICATION

- A. Wiremold 5500 Series three-channel surface non-metallic raceway shall be used within corridors to distribute data and low voltage system signals throughout the building.
- B. Wiremold 5400 Series two-channel surface non-metallic raceways shall be used within classrooms to distribute power and data to plug outlets and data receptacles.
- C. Wiremold 800 Series wiremold surface non-metallic raceway shall be used within classrooms to extend circuiting for the fire alarm system from the two-channel surface non-metallic raceway to the location of the notification appliance.
- D. Wiremold 5000 Series surface non-metallic raceway shall be used for horizontal runs @ 18" A.F.F. within offices to distribute power and data to plug outlets and data receptacles.
- E. A complete system of surface non-metallic raceways including all fittings and covers shall be installed as required to continuously route raceways around corners, transition between and route down walls, and provide all device terminations. Retaining clips shall be installed such that wiring and cabling shall be retained within the raceway when the cover is removed. All raceway fittings shall be specifically designed for the raceway type with which used. Raceways shall be listed by Underwriters Laboratories Inc.
- F. 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.
- G. 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.

- H. Galvanized Intermediate Metallic Conduit (IMC) **may** be used in indoor locations not in direct contact with earth.
- I. 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.
- J. 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.
- K. 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.
- L. 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 3/4" 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. 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.
6. 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. 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.

F. 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 to provide raceway systems for branch circuits and data network voice, video and other low-voltage wiring.
- B. Surface Mounted Raceways shall be used only in dry interior locations, as allowed in Article 388 (Surface Nonmetallic Raceways) of the California Electrical Code.
- C. 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.
- D. Electrical and mechanical rooms are specifically excluded from the use of non-metallic Surface Mounted Raceways.

3.6 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.

3.7 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.

3.8 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.

3.9 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. 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.
- H. 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.
- I. 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.

- J. 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.
- K. Boxes shall be sized for number of conductors entering box.
- L. 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.
- M. All device screw slots shall be left in a vertical orientation.
- N. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor and to outlet box with bonding jumper.
- O. Connect ground terminal of isolated-ground receptacles to isolated-ground conductor routed to designated isolated equipment ground terminal of electrical system.

3.10 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.

3.11 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.

3.12 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. 120/240V, 3 Phase, 4 Wire System.
 - a. Phase A: Black.
 - b. Phase B (Stinger): Orange.
 - c. Phase C: Blue.
 - d. Neutral: White
 - e. Ground: Green
 - 3. 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.
 - 4. Isolated ground conductor shall be green with a yellow stripe.
 - 5. Clock wiring shall be 4 #14 TW or THWN, color coded as follows:
 - a. Hot circuit Black
 - b. Correction circuit Red

- | | | |
|----|---------|-------|
| c. | Neutral | White |
| d. | 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.
- O. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.13 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.

3.14 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.

3.15 FIELD QUALITY CONTROL

- A. Test Owner's electricity-metering installation for proper operation, accuracy, and usability of output data.
 - 1. Connect a load of known kW rating, 1.5 kW minimum, to a circuit supplied by the metered feeder.
 - 2. Turn off circuits supplied by the metered feeder and secure them in the "off" condition.
 - 3. Run the test load continuously for eight hours, minimum, or longer to obtain a measurable meter indication. Use a test load placement and setting that ensure continuous, safe operation.
 - 4. Check and record meter reading at end of test period and compare with actual electricity used based on test load rating, duration of test, and sample measurements of supply voltage at the test load connection. Record test results.
 - 5. Repair or replace malfunctioning metering equipment or correct test setup; then retest. Repeat for each meter in installation until proper operation of entire system is verified.

3.16 SYSTEM TESTING AND STARTUP

- A. Refer to Specification Section 26 95 00 "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. Racco, 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. Feeders and branch circuits shall be provided with an insulated grounding conductor run with the circuit conductors. This grounding conductor shall be in addition to the ground path provided by the continuously grounded metallic raceway system that encloses the phase and neutral conductors.
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. Metal Poles Supporting Outdoor Lighting Fixtures

1. Ground pole to equipment grounding conductor run with supply branch circuit.

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.

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 262213
DRY-TYPE TRANSFORMERS (600 V AND LESS)

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. Provide and install dry-type **Energy Efficient** distribution transformers meeting United States Department of Energy DOE 2016 Energy Efficiency standards, with primary and secondary voltages of 600V and less and capacity ratings 15kVA through 1000kVA.

1.3 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate installation of wall-mounting and structure-hanging supports.

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. Product Data
 - 1. Submit rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.
- C. Shop Drawings
 - 1. Submit wiring and connection diagrams.
- D. Manufacturer Seismic Qualification Certification
 - 1. Submit certification that transformer assembly and components will withstand seismic forces defined in Specification Section 260100, "Seismic Anchorage and Bracing". Include the following:
 - a. Indicate whether withstand certification is based on actual test of assembled components or on calculation.

- b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
- 2. Submit Dimensioned Outline Drawings of Equipment Unit identifying center of gravity and locating and describing mounting and anchorage provisions.
- 3. Submit detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Test Reports
 - 1. Submit source quality-control test reports.
 - 2. Submit record of tap adjustments specified in Part 3 of this Section.
- F. Operation and Maintenance Data
 - 1. Submit operation and maintenance data for transformers to include in maintenance manuals specified in Division 01 and Specification Section 260100.

1.5 QUALITY ASSURANCE

- A. Transformers shall be manufactured and tested in accordance with NEMA ST 20-2014, "Dry-Type Transformers for General Applications".
- B. Transformers and accessories shall be listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Transformers shall comply with IEEE C 57.12.91-2011, "IEEE Standard Test Code for Dry-Type Distribution and Power Transformers".
- D. Transformers shall comply with UL 1561, "Standard for Dry-Type General Purpose and Power Transformers".
- E. Transformers losses for **Energy-Efficient Transformers**, rated 15 kVA and larger, shall be tested in accordance with the United States Code of Federal Regulations 10-CFR-431.196 procedures and shall be certified as meeting United States Department of Energy DOE 2016 Energy Efficiency Standards.

1.6 CODES AND STANDARDS

- A. All work and materials shall fully comply with current rules and regulations of all applicable codes. 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. Local Codes
7. NEMA ST 20-2014
8. IEEE C 57.12.91-2011
9. UL 1561
10. United States Department of Energy DOE 2016 Energy Efficiency Standards

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. This design is based on the use of equipment manufactured by Square D Company. Subject to compliance with project requirements, equivalent products by one of the following manufacturers may be considered:
 1. Square D Company
 2. General Electric Company
 3. Eaton
 4. Siemens
- B. Approved manufacturers shall be registered firms in accordance with ISO 9001:2015 SIC 3612 (US); which is the design and manufacture of low voltage dry type power, distribution, and specialty transformers.

2.2 MATERIALS

- A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
- B. Transformer cores shall be constructed from high grade, grain-oriented, non-aging silicon steel with high magnetic permeability and low losses.

- C. Transformer coils shall be of continuous wire-wound construction without splices, except for taps and shall be impregnated with non-hygroscopic, thermosetting varnish.

2.3 DISTRIBUTION TRANSFORMERS

- A. Comply with NEMA ST 20-2014, and list and label as complying with UL 1561.
- B. Provide transformers that are internally braced to withstand seismic forces specified in Specification Section 260100, "Seismic Anchorage and Bracing."
- C. Cores: One leg per phase.
- D. Indoor Enclosure: Ventilated, NEMA 250, Type 2.
- E. Indoor Enclosure: Ventilated, dripproof, NEMA 250, Type 2.
- F. Outdoor Enclosure: Ventilated, raintight, NEMA 250, Type 3R.
- G. Outdoor Enclosure: Totally enclosed, nonventilated, with lifting eyes, NEMA 250, Type 3R.
 - 1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
- H. Indoor Transformer Enclosure Finish: Comply with NEMA 250 for "Indoor Corrosion Protection."
 - 1. Finish Color: Gray
- I. Outdoor Transformer Enclosure Finish: Comply with NEMA 250 for "Outdoor Corrosion Protection."
 - 1. Finish Color: Gray.
- J. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.
- K. Taps for Transformers Smaller Than 3 kVA: None.
- L. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity
- M. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.
- N. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.
 - 1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.

2. Indicate value of K-factor on transformer nameplate.
- O. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.
1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
 2. Include special terminal for grounding the shield.
 3. Shield Effectiveness:
 - a. Capacitance between Primary and Secondary Windings: Not to exceed 33 picofarads over a frequency range of 20 Hz to 1 MHz.
 - b. Common-Mode Noise Attenuation: Minus 120 dBA minimum at 0.5 to 1.5 kHz; minus 65 dBA minimum at 1.5 to 100 kHz.
 - c. Normal-Mode Noise Attenuation: Minus 52 dBA minimum at 1.5 to 10 kHz.
- P. Wall Brackets: Manufacturer's standard brackets.
- Q. Fungus Proofing: Permanent fungicidal treatment for coil and core.
- R. Low-Sound-Level Requirements: Minimum of 5 dB less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.
- S. Low-Sound-Level Requirements: Maximum sound levels, when factory tested according to IEEE C57.12.91, as follows:
1. 9 kVA and Less: 35 dB
 2. 10 to 50 kVA: 40 dB
 3. 51 to 150 kVA: 45 dB
 4. 151 to 300 kVA: 50 dB
 5. 301 to 500 kVA: 55 dB
 6. 501 to 750 kVA: 57 dB
 7. 751 to 1000 kVA: 59 dB

2.4 ENERGY EFFICIENT DISTRIBUTION TRANSFORMERS

A. Ratings

1. All insulating materials are to exceed NEMA ST 20 standards and be rated for 220°C UL component recognized insulation system.
2. Transformers 15kVA and larger shall be 150°C temperature rise above 40°C ambient. Transformers 25kVA and larger shall have a minimum of 4 - 2.5% full

capacity primary taps. Exact voltages and taps to be as designated on the plans or the transformer schedule.

3. The maximum temperature of the top of the enclosure shall not exceed 50°C rise above a 40°C ambient.
4. Transformers shall have minimum efficiencies per DOE 2016 Energy Efficiency Standards when operated at 35% of full load capacity. Efficiency shall be tested in accordance with the United States Code of Federal Regulations 10-CFR-431.196 procedures.

Single Phase		Three Phase	
kVA	Efficiency	kVA	Efficiency
15	97.7%	15	97.89%
25	98.0%	30	98.23%
37.5	98.2%	45	98.40%
50	98.3%	75	98.60%
75	98.5%	112.5	98.74%
100	98.6%	150	98.83%
167	98.7%	225	98.94%
250	98.8%	300	99.02%
333	98.9%	500	99.23%
		750	99.28%

B. Construction

1. Transformer coils shall be of the continuous wound construction and shall be impregnated with non-hygroscopic, thermosetting varnish.
2. All cores to be constructed with low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point to prevent core overheating. Cores for transformers greater than 500kVA shall be clamped utilizing insulated bolts through the core laminations to ensure proper pressure throughout the length of the core. The completed core and coil shall be bolted to the base of the enclosure but isolated by means of rubber vibration-absorbing mounts. There shall be no metal-to-metal contact between the core and coil and the enclosure except for a flexible safety ground strap. Sound isolation systems requiring the complete removal of all fastening devices will not be acceptable.
3. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable UL and NEC standards.
4. The transformer enclosures shall be ventilated and fabricated of heavy gauge, sheet steel construction. The entire enclosure shall be finished utilizing a continuous process consisting of degreasing, cleaning, and phosphatizing, followed by electrostatic deposition of polymer polyester powder coating and baking cycle to provide uniform coating of all edges and surfaces. The coating shall be UL recognized for outdoor use. The coating color shall be ANSI 49.

C. Sound levels shall be warranted by the manufacturer not to exceed the following:

1. 15 to 50KVA - 45dB; 51 to 150kVA - 50dB; 151 to 300kVA - 55dB; 301 to 500kVA - 60dB; 501 to 700kVA - 62dB; 701 to 1000kVA - 64dB; 1001 to 1500kVA - 65dB; 1501 to 2000kVA - 66dB

2.5 CONTROL AND SIGNAL TRANSFORMERS

- A. Description: Self-cooled, two-winding dry type, rated for continuous duty, complying with NEMA ST 1, and listed and labeled as complying with UL 506.
- B. Ratings: Continuous duty. If rating is not indicated, provide at least 50 percent spare capacity above connected peak load.

2.6 SOURCE QUALITY CONTROL

- A. Test and inspect transformers according to IEEE C57.12.91.
- B. Factory Sound-Level Tests: Conduct sound-level tests on equipment for this Project.

2.7 ACCESSORIES

- A. Provide weather shields for all transformers located outdoors.
- B. Provide a locking mechanism for each circuit breaker supplying Class 1 transformer that is lockable in the off position. Provide and install a field applied marking on the transformer indicating the location of the remote mounted transformer primary disconnecting means.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.
- B. Verify that field measurements are as needed to maintain working clearances required by CEC and manufacturer's written instructions.
- C. Examine walls and floors for suitable mounting conditions where transformers will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

1. Brace wall-mounting transformers as specified in Specification Section 260100, "Seismic Anchorage and Bracing."
- B. Install floor-mounting transformers level on concrete bases. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit and 4 inches (100 mm) high.
- C. Anchor transformers to concrete bases according to manufacturer's written instructions and seismic codes at Project.
- D. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

3.3 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Ground equipment according to Division 26 Section "Grounding".

3.4 ADJUSTING

- A. Refer to Specification Section 269500, Electrical Acceptance Testing, for minimum required transformer testing by Contractor.

END OF SECTION 262213

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 SUMMARY

- 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 2022 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. 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.
- D. Lenses shall be virgin acrylic, 0.125 inches thick minimum, unless otherwise noted.
- E. There shall be no visible trademarks or monograms on the lighting fixtures.
- F. 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.
- G. 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
- H. Fixtures installed in non-hazardous locations shall conform to UL 1598.
- I. Light emitting diode (LED) equipment used in fixtures shall conform to UL 8750.
- J. Exposed hardware shall be stainless steel.

2.2 LED FIXTURES

A. LED Modules

1. Color Temperature: 4,000 Kelvin (K)
2. Color Consistency: 2-step MacAdams ellipse
3. Color Rendering:
 - a. Outdoor Fixtures: 70 CRI, or greater
4. Dimming: LED modules shall be compatible with the 0-10VDC dimmable LED driver.
5. Light Distribution: As indicated on Lighting Fixture Schedule
6. 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 independently tested by Intertek and shall bear the ETL Listed Mark as proof of meeting the applicable published safety standards.
2. 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.
3. 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.
4. LED Drivers shall comply with IEC standard 60929, Annex E and shall source no more than 2mA of control current at 0-10VDC.
5. LED Drivers shall be solid-state, electronic, high power factor (minimum 0.9).
6. LED Drivers shall have a Class A sound rating.
7. LED Drivers shall have internal thermal protection to limit driver case temperature to a maximum of 75-degrees C.
8. Ambient Operating Temperature Range: -40-degrees C to 55-degrees C.
9. Rated Frequency: 60-Hertz
10. 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 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 for 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.

2.4 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.

2.5 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. Install equipment level and plumb and according to manufacturer's written instructions.
- D. Fixture installation shall conform to all applicable standards for installation, mounting, wiring, and quality.

- E. All fixtures shall be grounded and bonded in accordance with applicable codes.
- F. All fixtures, lenses, and other trim shall be aligned, cleaned, free of paint and blemishes before final acceptance.
- G. 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 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. The 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. Lighting
- E. Title 24 Acceptance Testing
- F. Fire Alarm System

- G. Intercommunications, Clock, and Program System
- H. Special Systems
- I. Communication System

1.7 EQUIPMENT TO BE TESTED BY INDEPENDENT TESTING AGENCY

- A. Circuit Breakers Rated 100A and Greater
- B. Grounding System

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. All tests shall be recorded on the following forms:
 - a. 269500 - 1 MULTIPLE CONDUCTOR CABLE MEGGER TEST, 300V AND LESS
 - b. 269500 - 2 SINGLE & MULTIPLE CONDUCTOR POWER CABLE MEGGER TEST, 600V AND LESS
 - 3. 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. 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. Replace defective and burned out LED fixtures for a period of one-year following the time of substantial completion.
4. Give advance notice of dates and times for field tests.
5. Provide instruments to make and record test results.
6. 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.

D. Title 24 Acceptance Testing

1. Perform tests as outlined in Part 3 of Specification Section 266100.

E. Fire Alarm System

1. Perform testing in accordance with NFPA 72-2022.

F. 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.
- G. Special Systems
1. Security systems, sound reinforcement systems, and other special systems shall be tested in accordance with test plans submitted by their manufacturers and approved by the Owner. These test plans shall verify compliance with Specifications and proper operation including all inputs, outputs and accessories under all modes of operation.
- H. 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.

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

FORM 269500 – 1MULTIPLE CONDUCTOR CABLE MEGGER TEST, 300 VOLTS & LESS

WIRING - SIGNAL & COMMUNICATION CABLE

Testing shall be performed before connecting the cables to the terminals at either end. Continuity of each conductor shall be checked at this time. Each conductor shall be checked with a 500 volt megger to ground, with all other conductors in the cable and shield, grounded. The minimum acceptable megger resistance shall be 50 megohms for each conductor to ground.

PROJECT NAME _____

FEEDER NUMBER _____ LOCATION _____

CABLE SIZE _____ CABLE LENGTH _____

NO. OF CONDUCTORS _____ INSULATION TYPE _____

MANUFACTURER _____ LINE VOLTAGE _____

TEMPERATURE _____ HUMIDITY _____

MEGGER TYPE _____ SERIAL NUMBER _____

TEST VOLTAGE _____ MULTIPLIER _____

REMARKS _____

CONDUCTOR NO.	MEGOHMS		CONTINUITY		CONDUCTOR NO.	MEGOHMS		CONTINUITY	
	C/C	C/S	PASS	FAIL		C/C	C/S	PASS	FAIL

TEST PERFORMED BY _____

SignatureDate

TEST WITNESSED BY _____

SignatureDate

FORM 269500 – 2SINGLE & MULTIPLE CONDUCTOR POWER CABLE MEGGER TEST, 600 VOLTS & LESS

WIRING – FEEDER CIRCUITS

Testing shall be performed before connecting the cables to the terminals at either end. Continuity of each conductor shall be checked at this time. Each conductor shall be checked with a 500-volt megger to ground, with all other conductors (including shield) in the conduit or cable grounded. The minimum acceptable megger resistance shall be 50 megohms for each conductor to ground.

PROJECT NAME _____

FEEDER NUMBER _____ LOCATION _____

CABLE SIZE _____ CABLE LENGTH _____

NO. OF CONDUCTORS _____ INSULATION TYPE _____

MANUFACTURER _____ LINE VOLTAGE _____

TEMPERATURE _____ HUMIDITY _____

MEGGER TYPE _____ SERIAL NUMBER _____

TEST VOLTAGE _____ MULTIPLIER _____

REMARKS _____

Cable No	MEGOHMS Phase A	MEGOHMS Phase B	MEGOHMS Phase C

TEST PERFORMED BY _____

Signature

Date

TEST WITNESSED BY _____

Signature

Date

SECTION 270000
COMMUNICATIONS, PAGING, & SIGNAL CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The drawings and general provisions of the Contract Documents apply to this Section.

1.2 SCOPE AND SUMMARY

- A. Provide a fully operational IP platform for a district-wide internal and school Critical Communications System (CCS), incorporating school safety notifications and general communications including but not limited to the following:
1. The platform shall provide complete internal communications and employ state of the art IP Technology including the minimum functions listed.
 - a. Two-way internal intercommunications between staff locations and classrooms.
 - b. Scheduled bell events.
 - c. Emergency announcements that will override any pre-programmed audio, assuring that all Emergency/Lockdown etc., are heard at each speaker location.
 - d. Capability of prerecording emergency announcements that can be activated by a Soft Key on an administrative console, panic button, dial string, mobile app, or web browser.
 - e. Atomic Time Synchronization with Class Change Tones utilizing multiple, programmable schedules for each zone.
 - f. District-wide, Emergency, Group, All School and Zone live voice paging.
 - g. District-wide, Emergency, group, All School and Zone visual messaging.
 - h. District-wide, Emergency, Group, All School and Zone paging for pre-recorded audio – tones, music and voice.
 - i. Single sign on web-based user interface for multi-school functionality.
 2. The system shall support a minimum of 1000 level priorities which shall be user-definable, allowing each end point to place a minimum of 5 different priority calls at the same time.
 3. Any authorized administrator shall be able to call from outside the school into any classroom, zone, or entire school directly via the School District supplied SIP enabled Telephone Network. This shall allow remote monitoring, call-in annunciation, and two-way conversation from outside the facility as well as paging into the system. (Compliance with NEMA Standard SB-40 for emergency communications in K-12 Schools).

4. Authorized system users shall be able to create a minimum of 100 automated sequences with voice instructions, tones, emails, program distribution, and relay activations and replay them.
 5. Automated message strings shall be manually initiated from a single-button access on the console, on a SIP connected telephone, panic button, mobile app, from the web-based user interface or via interface with third party systems.
 6. Paging and two-way intercom features shall be accessible from any system console or SIP connected telephone for each campus.
 7. The platform shall synchronize its system time to the network timeserver or a web-based time server.
 8. Each single campus installation shall be locally survivable for intercom, paging, bells, and emergencies such as lockdown, even when the district connection is unavailable.
 9. This specification establishes a minimum level of quality, features, and performance for individual components as well as the integrated system.
 10. Systems that do not comply with the feature-sets highlighted in this Specification will not be considered.
 11. Included in the emergency procedures is the ability to send specific messages and or instructions. These features can be added to the emergency sequences.
 12. The ability to require an access code to initiate or clear an emergency from the administrative console.
 13. An app that can run on either Android or Apple phones. This app shall give the user the ability to initiate one of 18 emergency procedures programmed into the app. This app shall also allow you to view all classrooms check in status. This process will update during the emergency to make sure all information is current.
 14. Any system that requires more than one Cat 6 drop to a classroom to control an IP speaker and a call switch will not be considered equal to the specified system.
- B. The new Critical Communication System (CCS) will replace an existing intercom system. During construction, the existing system shall remain operational when students are in attendance at the school. After the new CCS is operational throughout the school, the existing system shall be disconnected and removed from the school. The contractor shall return existing parts and pieces to the Owner and remove existing wiring back to the source.

1.3 MANUFACTURER

- A. The contractor shall furnish and install all equipment, accessories, and materials necessary for a complete operating system in accordance with the specification and applicable drawings.
- B. The equipment furnished under this specification shall be the standard product of one manufacturer and shall be equal in performance and quality to that manufactured by

Rauland or CareHawk Safety Communications or equal. Products having less than 5 years field service will not be acceptable.

- C. The contractor shall guarantee availability of local service (within 50 miles) by factory-trained personnel from an authorized distributor of the equipment manufacturer. The distributor shall have available stock of the manufacturer's standard parts. On-the-premises maintenance shall be provided for a period of twelve (12) months from date of project completion.
- D. On-the-premises demand service at other than normal working hours shall also be available and may be charged for by the manufacturer's distributor at the prevailing labor rates.
- E. Approved manufactures representative shall provide on-site training for site and maintenance personal, as well as furnish District with complete as-built drawings.

1.4 SUBMITTALS AND SUBSTITUTIONS

- A. Within thirty-five (35) calendar days after the date of the award of the contract, the Contractor shall submit to the Owner for review an electronic copy submittal. The submittal shall consist of five (5) major sections with each section separated with insertable index tabs. The first section shall be the "Index" which shall include the project title and address, name of the firm submitting the proposal and name of the Engineer and Owner. Each page in the submittal shall be numbered chronologically and shall be summarized in the index. The second section shall include a copy of the authorized distributor's valid C-61 California State Contractor's License, letters of factory authorization and guaranteed service, list of projects of equal scope and a list of proposed instrumentation to be used by the Contractor. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment in the specifications. The fourth section shall contain a wiring destination schedule for each circuit leaving each piece of equipment. The fifth section shall include a complete drawing with devices and wire type and quantity.
- B. For purposes of determining equality, all mechanical, electrical and general information set forth on the respective data sheets for each specified item shall be considered as part of these specifications and binding herein. Any proposed equal item offered shall be substantiated fully to prove equality. The Owner reserves the right to require a complete sample of any proposed equal item and may, if necessary, request a sample tested by an independent testing laboratory to prove equality. The decision of the Owner regarding equality of proposed equal items will be final.
- C. Submit equipment prints, inter-panel and intra-panel, full electronic wiring diagrams and specification sheets for each item specified herein. Provide a tabulation of the specification clearly comparing the submitted item with the specified item, being able to refer to all written expressed functions and capabilities. Specification Sheets shall be submitted on all items including cable types.
- D. Shop Drawings: Prior to proceeding with the work: Provide detailed equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, location of each field connection, and a complete schedule of

all equipment and materials with associated manufacturer's cuts sheets which are to be used.

1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Identify terminals to facilitate installation, operation, and maintenance. Include a single-line diagram showing cabling interconnection of components and levels throughout system and impedances.
 2. Artwork drawings and lists indicating proposed nameplate nomenclature and arrangements for control panels and plug panels prior to fabrication reflecting equipment used.
 3. Each drawing shall have a descriptive title and all sub-parts of each drawing shall be labeled. All drawings shall have the name and locations of the project, Systems Contractor's name in the title block.
 4. Details and descriptions of any other aspect of the system, which must differ from the contract documents due to field conditions or equipment, furnished.
- E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Include record of final matching transformer-tap settings, and signal ground-resistance measurement certified by Installer.
- F. The Contractor shall furnish a letter from the manufacturer of the equipment, which certifies that the equipment has been installed according to factory intended practices, that all the components used in the system are compatible and that all new portions of the systems are operating satisfactorily. Further, the Contractor shall furnish a written unconditional guarantee, guaranteeing all parts and all labor for a period of one (1) year after final acceptance of the project by the Owner.
- G. Operating and Service Manuals: The Contractor shall provide two (2) printed copies and one (1) matching PDF copy of an "Operating and Serving Manual" for the system. The printed manuals shall be bound in flexible binders. All data shall be on printed material. Each manual shall include the following:
1. Record of Owners equipment-programming option decisions.
 2. All instructions necessary for proper operation and manufacturer's instructions.
 3. Complete as-built installation drawings (Record Drawings) of the system.
 4. A wiring destination schedule for each circuit leaving each piece of equipment.
 5. Schematic diagram of each amplifiers and other major components with transistor complements and replacement number.
 6. "Proof of Performance" information.
 7. Manufacturer's maintenance information.
 8. Copies of non-proprietary computer programs and system set up disks documenting all programmable features of the installed system.

- H. Record Drawings: Prior to final acceptance, provide three (3) complete sets of printed drawings and one (1) matching PDF copy of the drawings that indicate all cable numbers and construction details in accordance with the actual system installation. Revise all shop drawings to represent actual installation conditions. These Record Drawings will be used during "Final Acceptance Testing".
- I. System Training: Submit the following information describing the training programs and system trainers as outlined in **Paragraph 1.6** of this specification and in accordance with Division 1 specifications.
 - 1. Include with the submittal a preliminary staff development training program in outline form for review and approval by the owner's representative.
 - 2. Include with the submittal a current copy of the trainer's certification from the manufacturer that certifies and identifies the trainer(s) who are eligible to provide training and support for the project.
 - 3. Include with the submittal a current copy of trainer's needs assessment form which will be reviewed with the owner's designated representative for the system's preliminary system programming and configuration.
 - 4. Include with the submittal copies of all documentation used to identify for the owner those participants attending and completing the training programs.
- J. A copy of the manufacturer's standard statement of warranty proving all equipment provided for the school communications network is covered with the required five-year warranty shall be included with the project submittal. This statement of warranty shall be provided on the manufacturer's stationary.

1.5 QUALITY ASSURANCE

- A. All items of equipment including wire and cable shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.
- B. The contractor shall be an established communications and electronics contractor that has had and currently maintains a locally run and operated business for at least five years. The contractor shall utilize a duly authorized distributor of the equipment supplied for this project location with full manufacturer's warranty privileges.
- C. The contractor shall show satisfactory evidence, upon request, that the supplier maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The supplier shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.
- D. Comply with NEMA Standard SB-40 for Emergency Communications in K-12 schools.
- E. Comply with UL 60950.

- F. Electrical Component Standard: Provide work complying with applicable requirements of NFPA 70 "National Electrical Code" including, but not limited to:
1. Article 250, Grounding
 2. Article 300, Part A. Wiring Method
 3. Article 310, Conductors for General Wiring
 4. Article 725, Remote Control, Signaling Circuits
 5. Article 800, Communication Systems
- G. EIA Compliance: Comply with the following Electronics Industries Association Standards:
1. Sound Systems, EIA-160
 2. Loudspeakers, Dynamic Magnetic Structures and Impedance, EIA-299-A
 3. Racks, panels and Associated Equipment, EIA-310-A
 4. Amplifiers for Sound Equipment, SE-101-A
 5. Speakers for Sound Equipment, SE-103
- H. EQUIPMENT MANUFACTURER'S REPRESENTATIVE
1. Installation and startup of all systems shall be under the direct supervision of a local agency (Equipment Manufacturer's Representative) regularly engaged in installation, repair and maintenance of such systems. The supplier shall be accredited by the proposed equipment manufacturers and be prepared to offer a service contract for system maintenance on completion of the guarantee period and to provide the names, locations and size of ten (10) recent successful installations in the area.
 2. As further qualification for bidding and participating in the work under this specification the manufacturer's representative shall hold a valid C-61 Contractor's State License Board of California. The manufacturer's representative shall have completed at least ten (10) projects of equal scope, giving satisfactory performance and has been in the business of furnishing and installing sound systems of this type for at least five (5) years. The manufacturer's representative shall be capable of being bonded to assure the owner of performance and satisfactory service during the guarantee period.
 3. The manufacturer's representative shall provide a letter with the submittals from the manufacturer of all major equipment stating that the manufacturer's representative is an authorized distributor. This letter shall also state the manufacturer guarantees service performance for the life of the equipment, and that there will always be an authorized distributor assigned to service the area in which the system has been installed.
- I. The contractor shall guarantee availability of local service by factory-trained personnel of all specified equipment from an authorized distributor of all equipment specified under this section. On-the-premise maintenance shall be provided at no cost to the purchaser

for a period of one (1) year (parts and labor) from date of acceptance unless damage or failure is caused by misuse, abuse, neglect or accident. Additionally, all **Rauland or CareHawk Safety Communications** manufactured products shall be covered by a five (5) year (parts only) limited warranty from the date of acceptance. The warranty period shall begin on the date of acceptance by the owner/engineer.

- J. The contractor shall, at the owner's request, make available a service contract offering continuing factory authorized service of the system after the initial warranty period.
- K. The supplier shall visit the sites and familiarize himself with the existing conditions and field requirements prior to submitting a proposal.

1.6 IN-SERVICE TRAINING

- A. The contractor shall provide and implement a complete and comprehensive staff training program for all administrators, facility staff members, and teachers. This mandatory training program will provide school staff a complete understanding of how to utilize and properly operate all functions.
- B. The training program shall be implemented by a staff member/trainer employed by the contractor. The trainer must be factory certified to provide training on their product.
- C. All staff development training is to be coordinated through the owner's designated representative. As training sessions are completed, the trainer will provide the school's administrative staff and school district's staff a document listing all the staff and faculty members who attended, received, and completed the training program.

1.7 WARRANTY

- A. Provide a manufacturer's five-year warranty of the school communications network equipment against defects in material and workmanship. This warranty will cover all electronic system components. Additional warranties cover clocks, speakers, and call in switches. If any defects are found within the warranty period, the defective equipment shall be replaced at no cost (equipment only); a one-year warranty shall be provided for labor.
- B. A copy of the manufacturer's standard statement of warranty proving all equipment provided for the school communications network is covered with the required five-year warranty shall be included with the project submittal. This statement of warranty shall be provided on the manufacturer's stationary. The standard five-year warranty is an important element in establishing a standard in quality. Manufacturers who circumvent the five-year warranty by offering special "extended warranties" that are not part of their normal published warranty will not be accepted.
- C. Contractor shall respond, excluding weekends and holidays, within 24 hours to any warranty service calls. If equipment cannot be repaired within 24 hours of service visit, the contractor shall provide "loaner" equipment to the facility at no charge.

- D. Make available a service contract offering continuing factory authorized service of the system after the initial warranty period.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

- A. The platform shall utilize state of the art IP Technology for Emergency automation, Call-in Notification, School Safety Paging and Evacuation tones, Class Change Tones utilizing multiple, programmable schedules for each zone, two-way hands-free everyday internal communications and paging, visual messaging, and program distribution. The system shall be easy to learn and operate. All standard programming shall be web-based, district-wide and user friendly to allow the system administrator the ability to easily program system features.
- B. Provide complete and satisfactorily operating district/school communications and district/school safety as described herein, using materials and equipment of types, sizes, ratings, and performances as indicated. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.
- C. The platform shall be a single electronic system consisting of a minimum of 10 audio channels for each campus, (classroom) IP Speaker Modules and call switches, IP Zone Modules connecting corridor speakers, inside and outside horns, IP Administrative Consoles, SIP enabled PBX integration and district-wide integration for paging, emergency notifications, calendar scheduling and configuration.
- D. Each Classroom shall be provided with a Speaker Module interface, a speaker, and a call switch.
- E. Call-ins may automatically annunciate (display of priority and location) to administrative consoles, SIP enabled phones, and outside phones.
- F. Call-ins shall be programmed to automatically change priority and annunciation route based on age of call-in and original priority.
- G. Call-ins may have priority (and annunciation route) changed by user action from a console or SIP enabled phone.
- H. Call-in annunciation route shall include playing pre-recorded audio over speakers, sending a pre-configured email, and activating relays.
- I. The platform shall lend itself to expansion by simple addition of hardware modules.
- J. The platform shall connect directly to an existing, standard protocol WAN/LAN network, without the need for a separate server at each school location. Configuration, including bell schedules, calendars, and emergency sequences can be remotely created,

changed, stored and downloaded to the system by an authorized user from a web-based user interface. The platform shall utilize two spare strands of the 12-strand single mode fiber optic cabling provided between the MDF and the IDFs on the school campus. The two strands utilized shall be clearly labeled at the MDF and the IDFs.

- K. The platform shall provide the ability to initiate school safety paging announcements, evacuation tones and take cover tones from any telephone or connected web browser within the facility or outside the facility to any other location within the facility or district.
- L. The platform shall provide the ability to selectively communicate or monitor individual classrooms in emergency situations from any telephone within the facility or outside the facility to any other location within the facility; all communication within the classroom shall be hands-free and will not require any interaction by the classroom user.
- M. The platform shall provide classroom users the ability to confirm that they have safely secured their classrooms during an emergency with a single button press. The front office administrator will receive confirmation that the classroom is safely secured via an administrative console and web-based user interface. The front office administrator can view classrooms that are not safely secured via the administrative console. The front office administrator can view classrooms that are not safely secured via the web-based user interface. The front office administrator shall be able to initiate two-way communication, without a pre-announcement tone, to the classroom during an emergency via the administrative console. Web-based user interface will still identify that a school is in an emergency, even if all classrooms are safely secured. Individual classroom check-in and school emergency status shall be viewed from the web-based user interface, both on-site and remotely.
- N. IP Addressable and POE powered Speaker Modules for individual rooms shall be system programmable and may be assigned any two, three, four, five- or six-digit Alpha Numeric designation as well as name and description. Any extension may be reassigned at any time. Coordinate and verify assigned room numbers with SUSD Facilities Planning.
- O. IP-enabled two-way voice communication shall be available from any provided telephone or administrative console through any speaker in a campus. This shall allow hands free communication to any classroom or any individual loudspeaker unit. A programmable pre-announce tone shall sound immediately before the intercom path is opened and a supervisory tone shall continue to sound at regular intervals when speaker monitoring is active, complying fully with all privacy legislation. Pre announce tone and supervisory tones shall be disabled during designated emergencies automatically.
- P. The platform shall allow users to configure multiple schedules per school, with a minimum of 500 unique events per schedule, and automatic Daylight Savings time correction. Schedules can be programmed to occur once, daily, weekly, monthly, or in any combination of the preceding recurrences. Each school may have a minimum of 20 unique bell schedules, with a minimum of 5 active schedules on any given day for each campus. User shall be able to select from 25 standard included tones as well additional user created and uploaded audio files for class change signaling and messaging. In addition, scheduled events shall include relay actions, email notifications, visual messaging, status lights and paging exclusions as system configuration changes. The platform shall allow control of the bell schedules via the district WAN/LAN without the need for a separate server at each school location. Bell schedules can be remotely

created, changed, stored and assigned to calendar days for the local school by an authorized user from a single web-based user interface, without logging into multiple systems.

- Q. The platform shall be able to integrate with an existing PA system or operate as a fully independent IP solution. The platform shall be able to function in combination of said configurations and allow for seamless communication within a school or district-wide, regardless of the type of configuration used. The platform shall be scalable, with the ability to easily add, install, and configure additional equipment to a system.
- R. The platform allows for customization of preprogrammed sequences, used for emergencies, events, and everyday communications. Preprogrammed sequences can be activated from the push of a relay button, soft key of an administrative console, a dial string of a SIP phone, or a web browser configured to the district network. Sequences can be initiated automatically as part of a schedule or on the fly. Preprogrammed sequences can be customized to utilize any combination of audio tones, emails, relays, tone exclusions, swings, delays, duples, SIP phone notifications, and program distribution. Audio tones can include customized audio files and voice messages, recorded in any language. Uploaded audio tones and messages can be preprogrammed to announce repeatedly or individually, as part of a scheduled sequence or on the fly. Each school in a district can have its own customized sequences, and can be activated individually, in groups, or district-wide.
- S. The platform allows for emergencies to be initiated in a drill environment, separate from real emergencies. Drill emergencies can be initiated from panic buttons, consoles, SIP phones, or a web browser.
- T. The platform shall provide status lights that will display the status of individual classrooms and school-wide status, including for emergencies, at the same time. Status lights will be customizable in color and flash rate based on event type and priority.
- U. POE zone page amplifier module. This component will give the schools the ability to play audio to drive groups of speakers from a single device. Depending upon configuration you can have 14 or 35 watts of output. The module can be either wall or rack mounted.
- V. First Responders Notification. This feature can be initiated so the status lights do not display the rooms that checked in until the first responders are on site. This will not influence any of the other check-in notifications. The App, console and computers can still display the rooms that checked in.
- W. Emergency Initiation App. An app shall be available for installation on either Android or Apple devices. The app shall be capable of processing up to 18 different emergencies. The app shall update in real time, rooms that have checked in OK. It shall also display that a Fire emergency is in effect during an emergency.

2.2 EQUIPMENT AND MATERIAL

- A. The Critical Communications System (CCS) shall be a **Rauland Telecenter U** or a **CareHawk Safety Communications CH1000(LT)** or an approved equal system.

B. IP Addressable Modules:

1. System shall provide multiple IP Addressable Modules for intercom, paging and relay activation.
 - a. All Modules are POE 802.3af compliant
 - b. All Modules support DHCP.
 - c. All Modules connect to network with a single RJ45 connector
2. IP Addressable Speaker Module
 - a. Shall interface to school's data network, a classroom speaker, and multiple call switches.
 - b. A minimum of 5 levels of call-in can be placed from an IP Speaker Module. The call-ins are routed to administrative consoles and select SIP connected telephones and can only be cleared from the system once answered. If a call-in is not answered within a preprogrammed time the call-in may reroute to other telephones, consoles, and speakers.
 - c. An option for Privacy call in switches is supported. When the Privacy switch is activated it prevents administrative or classroom telephones from monitoring the specific classroom/location intercom speaker.
 - d. The ability to belong to one or more of a minimum of 100 independent zones for zone paging, program/music distribution zones and class change tone zones; this assignment is a programmable function, changeable by time of day. Each IP Speaker Module's location shall be programmed in software to belong to any combination of software zones. IP Speaker Modules shall be designed to mount near ceiling and wall speakers and in the plenum space.
 - e. Intercom and paging volume adjustable from Software interface.
 - f. Module will support and power a status light that displays individual classroom information including call-ins placed, testing status and emergency check-in status.
3. IP Addressable Zone Paging Module
 - a. Zone Paging Module shall connect multiple speakers for district all page, all page, zone paging, bells, audio events and, emergency notification.
 - b. Zone Paging Modules shall be rack and wall mountable.
 - c. Zone Paging Modules shall be able to belong to one or more of 100 independent zones for live paging, bells, pre-recorded audio and emergency notification.

C. IP Addressable Analog Gateway

1. IP Addressable Gateway provides integration with existing analog wiring infrastructure – consisting of shielded two-pair classroom field wiring. The Gateway provides the ability to reuse speaker wiring, speakers, and punch blocks to integrate analog infrastructure with IP platform.
2. Each Gateway will have 5 watts of power per port and 25 watts total per device.

3. Supports 24 classrooms that utilize 25 Volt speakers and all current intercom system call switches for front office notification.
4. Supports reusing existing shielded two-pair classroom field wiring.
5. Classroom intercom volume adjustable from Software interface.
6. Classroom paging volume adjustable from Software interface.
7. Configured to the school network and can be used in conjunction with IP Addressable Modules.

D. Audio Paging/Program Amplifiers

1. Power amplifier(s) shall be provided to provide a minimum of 2 watts of power to all paging speakers, and 15 watts of power to all paging horns.
2. The maximum load on the paging/program amplifiers shall be 80% of the rated maximum output of the amplifiers.

E. Single Function Call Switch

1. Call Switches indicated on the drawings shall provide the following functions and features:
 - a. Call switch that shall activate a call from single button activation. The button will route the call-in to any one or more Administrative Consoles for quick and easy response from an Administrative Console.

F. Zone Page Amplifier Module

1. Depending on configuration the amp output is either 14- or 35-watts output.
2. Can be wall or rack mounted.
3. Powered with either a wall wort or POE+

G. Interior Speakers

1. Provide Speaker Assembly consisting of 8 Ohm, 8" speaker with a power rating of 8 watts and mounted on a baffle with an integrated back box that covers the full area of the baffle. Transformer assembly shall be dual voltage multi-tap type suitable for 25 or 70-volt installations.
2. The speaker shall be connected by inserting an 8-pin RJ45 terminated Cat 6 cable.
3. Speakers shall be vandal resistant and white in color.

H. Exterior Wall Mounted Horns

1. Provide double re-entrant type horn loudspeakers with integral driver. The horn loudspeaker shall be impervious to weather and vandalism. Horn shall be constructed of heavy-duty ABS plastic. Horn loudspeaker drivers shall be rated at 15 watts with a frequency response of 480 Hz to 14 KHz. Sensitivity shall be 106 dB 1 watt, 1 meter. Transformer assembly shall be dual voltage multi-tap type suitable for 25 or 70-volt installations. Dispersion pattern shall be 180 degrees

conical. The horn loudspeaker shall be constructed of treated heavy gauge aluminum, with all exposed parts potted and a sealed driver. Wiring terminal shall be fully enclosed. The speaker flange and mounting surface shall have a cork-rubber gasket. The horn loudspeakers finish shall be gray baked on enamel.

2. The recessed back box shall be of heavy gauge cold-rolled steel, spot welded for stability with a rust-retardant gray primer finish. Acoustically treat the interior to eliminate mechanical resonance. The back box shall be 10-3/4"x10-3/4"x6" deep.
3. The baffle shall be vandal proof, the faceplate constructed of 14-gauge carbon steel with a minimum tensile strength of 55,000 PSI. A lattice grid sub-plate shall deny access to the horn but be acoustically transparent for sound projection. Provide tamper proof, stainless steel mounting hardware. The baffle shall have a mar/scratch baked epoxy rust inhibitive finish.

2.3 CONDUCTOR

- A. All conductors shall be run in conduits/enclosed raceways. Refer to project manual section 27 20 00 "Data Cabling and Infrastructure" for types of cables.
- B. All underground intercom wire between buildings shall be Aquaseal.

PART 3 - EXECUTION

3.1 3.1 DIVISION OF WORK

- A. While all work included under this specification is the complete responsibility of the Contractor, the division of actual work listed following shall occur.
- B. The conduit, outlets, etc., which form part of the rough-in work shall be furnished and installed complete by the Electrical Contractor. The balance of the system, including installation of speakers and equipment, making all connections, etc., shall be performed by the manufacturer's authorized representative, and the entire responsibility of the system, its operation, function, testing and complete maintenance for one (1) year after final acceptance of the project by the Owner, shall be the responsibility of this organization.

3.2 EXAMINATION

- A. Examine conditions, with the Installer present, for compliance with requirements and other conditions affecting the performance of the School Communications and School Safety Network.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.3 3.3 INSTALLATION

- A. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.
- B. Furnish and install all material, devices, components and equipment for a complete operational system.
- C. Impedance and Level Matching: Carefully match input and output impedance's and signal levels at signal interfaces. Provide matching networks where required.
- D. Control Circuit Wiring: Install control circuits in accordance with NFPA 70 and as indicated. Provide number of conductors as recommended by system manufacturer to provide control functions indicated or specified.
- E. All housings are to be located as indicated.
- F. The contractor shall provide necessary transient protection on the AC power feed, all copper station lines leaving or entering the building, and all central office trunks. All protection shall be as recommended by the equipment supplier and referenced to earth ground.
- G. Plug Disconnect: All major equipment components shall be fully pluggable by means of multi-pin receptacles and matching plugs to provide for ease of maintenance and service.
- H. Protection of Cables: Cables within equipment racks, etc., shall be grouped and bundled (harnessed) as to type and laced with No. 12 cord waxed linen lacing twine or T & B "Ty-Rap" cable. Edge protection material ("cat-tract") shall be installed on edges of holes, lips of ducts or any other point where cables or harnesses cross metallic edge. All wiring shall be in conduit. Conceal conduits in ceiling and walls whenever possible. Interior exposed conduits shall be "surface raceway" type installed parallel and at right angle to room dimensions. Surface raceway shall be installed tight against wall/ceiling and wall/wall room edges. Conduit/raceways shall be installed as per section 26 05 00 "Basic Material & Methods and 2019 CEC.
- I. Cable Identification: Cable conductors shall be color-coded and individual cables shall be individually identified. Each cable identification shall be a unique number located approximately 1-1/2" from cable connection at both ends of cable. Numbers shall be approximately 1/4" in height. These unique numbers shall appear on the As-Built Drawings.
- J. Shielding: Cable shielding shall be connected to common ground at point of lowest audio level and shall be free from ground at any other point. Cable shields shall be terminated in same manner as conductors.
- K. All cable and wires shall be labeled at IDF cabinets, speakers, call-in switches and at Campus Controller.

- L. Nameplates: IDF cabinets and Junction boxes shall have plastic engraved nameplate to identify each with Drawings and Specifications. Nameplate letters or numbers shall be minimum 3/8" high.
- M. Outlet Box Identification: All outlet boxes mounted in attic space shall be individually identified with waterproof marker.
- N. All cables shall be run in continuous lengths between IDF cabinets and equipment, no splicing permitted.
- O. Contractor is responsible for performing underground survey of all areas to be trenched to locate all existing utilities. Contractor will repair any damaged underground utilities at no cost to the District.
- P. All intercom Stations shall be labeled with the circuit feeding the system.
- Q. Provide physical isolation from speaker microphone, telephone, line level wiring, and power wiring. Run in separate raceways, or where exposed or in same enclosure, provide 12-inch minimum separation between conductors to speaker microphones, telephone wiring and adjacent parallel power. Provide physical separation as recommended by equipment manufacturer for other system conductors.
- R. Identification of Conductors and Cables: Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams.
- S. Weatherproofing: Provide weatherproof enclosures for items to be mounted outdoors or exposed to weather.

3.4 GROUNDING

- A. Provide equipment grounding connections for Integrated Electronic Communications Network systems as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.
- B. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.
- C. Provide all necessary transient protection on the AC power feed and on all copper station lines leaving or entering the building. Note in system drawings, the type and location of these protection devices as well as all wiring information.
- D. The contractor shall note in their system drawings, the type and location of these protection devices, as well as all wiring information.
- E. The contractor shall furnish and install a dedicated, isolated earth ground from the central equipment rack and bond to the incoming electrical service ground buss bar.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide services of a duly factory authorized service representative for this project location to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.
- B. Inspection: Make observations to 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.
- C. Testing: Rectify deficiencies indicated by tests and completely re-test 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.

3.6 FINAL ACCEPTANCE TESTING

- A. The Final Acceptance Testing shall be provided to the Owner or the Owners designated representative only. Final acceptance testing to any other trade or service provider for the project will not comply with the requirements of this section.
- B. The contractor will provide a Final Acceptance Test record document signed by both the contractor and the Owner or designated Owner's Representative establishing the "In Warranty" date. The warranty period will not commence until the Final Acceptance Test is completed.
- C. Be prepared to verify the performance of any portion of the installation by demonstration, listening and viewing test, and instrumented measurements. Make additional adjustments within the scope of work and which are deemed necessary by the Owner because of the acceptance test.

3.7 COMMISSIONING

- A. The contractor shall train the Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of the system. This training will be in accordance with the training as outlined in **Paragraph 1.6** of these specifications. In addition to the Training Materials provided, the contractor will also furnish Operators Manuals and Users Guides at the time of this training.
- B. Schedule training with Owner through the owner's representative, with at least seven days advance notice.

3.8 OCCUPANCY ADJUSTMENTS

- A. The contractor shall provide Occupancy Adjustments in accordance with Section 1.6 of these specifications. A response scenario amenable to both the owner and the contractor will be established and followed for the first year of service.

3.9 CLEANING AND PROTECTION

- A. Prior to final acceptance, the contractor shall vacuum and clean all system components and protect them from damage and deterioration. All blank spaces in equipment cabinets will be covered with blank panels. Top and side panels, and all cabinet doors will be installed. All general areas within and around all equipment rack/cabinets in the facility will be swept, vacuumed, and cleaned up. No cabinets will be left unlocked and all cabinet keys will be turned over to the owner or designated owner's representative.

END OF SECTION

SECTION 270528
PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Work included: Provision of materials, installation and testing of:

1. Raceways
2. Rigid Metal Conduit and Fittings
3. Electrical Metallic Tubing and Fittings
4. Conduit Accessories
5. Penetration Sealing Systems
6. Telecommunications Outlet Boxes
7. Telecommunications Equipment Racks (IDF)
8. Pull Boxes
9. Innerduct
10. Innerduct Fittings
11. Wire Basket Runway

1.2 RELATED SECTIONS

A. Contents of Division 26 and Division 01, General Requirements apply to this Section.

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00 and Division 01, General Requirements.

1.4 SUBMITTALS

A. Submittals as required by Section 26 00 00 and Division 01, General Requirements.

B. In addition, provide:

1. Plan drawings showing completions and as-built corrections which indicate type, size, placement, routing, and/or length for raceway and cable tray components; e.g., manholes, handholes, conduit, wireway, boxes, enclosures, etc.

1.5 QUALITY ASSURANCE

- A. Quality assurance as required by Section 260000 and Division 01, General Requirements.

1.6 WARRANTY

- A. Warranty of materials and workmanship as required by Section 26 00 00 and Division 01, General Requirements.

1.7 DEFINITIONS

- A. Cabinet: A freestanding floor-mounted modular enclosure designed to house and protect rack-mounted electronic equipment.
- B. Conduit: Round raceway.
- C. Conduit Body: Separate portion of a conduit or tubing system that provides access through removable cover(s) to the interior of the system at a junction of two or more sections of the system or at a terminal point of the system.
- D. Pull Box Enclosure: Box with a cover installed in one or more runs of raceway to facilitate pulling conductors through the raceway system. There are no openings in the cover.
- E. Raceway: Enclosed channel designed expressly for holding wires or cables. Metal or insulating material, and the term includes conduit, tubing, wireways, underfloor raceways, and surface raceways; does not include cable tray.
- F. Surface Raceway: Surface-mounted metal channel or plastic duct with snap-in removable covers for housing and protecting electrical wires and cables. Raceway and fittings are designed so sections can be electrically and mechanically coupled together without subjecting cables to abrasion.
- G. Wireway: Sheet metal or nonmetallic troughs with hinged or removable covers for housing and protecting electrical wires and cables and in which conductors are laid in place after the wireway has been installed as a complete system.
- H. Wire Basket Runway Systems: Includes, but are not limited to straight sections of type wire basket runway cable trays, bends, tees, elbows, drop-outs, supports and accessories.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers as specified in specific article below.

2.2 RACEWAYS

- A. Raceways: Labeled and/or listed as acceptable to the Authority Having Jurisdiction (AHJ) as suitable for the use intended.

Table 1 -Product Identification

Product Designation	Product Type
RGS	Rigid galvanized steel.
CRS	PVC externally coated RGS.
EMT	Galvanized steel tubing.
PVC	Polyvinylchloride conduit.
ENT	Electrical nonmetallic tubing.
LMC	Liquidtight metal conduit.
LNC	Liquidtight nonmetal conduit.

- B. The product identification codes used for the Communications Raceways and Boxes in Part 2, Products, are summarized in Table 1.
- C. Manufacturers:
1. Koppers Bitumastic.
 2. Scotchwrap.
- D. Bitumastic material or plastic tape.

2.3 RIGID METAL CONDUIT AND FITTINGS

- A. Conduit:
1. Type RGS: Rigid galvanized steel.
 2. Type CRS: PVC externally coated conduit; rigid steel conduit with external PVC coating and internal galvanized surface.
- B. Fittings and Conduit Bodies: In-line straight-through, threaded, galvanized steel fittings and Type C conduit bodies only; do not use bends or tees, e.g., Lbs.
1. Bonding and Grounding Locknuts and Wedges: Malleable iron with set screws and lug screws.
 2. Insulated Bushing: Malleable iron with integral insulated throat, rated for 150C.
 3. Bonding and Grounding Bushing: Malleable iron with integral insulated throat, rated for 150C, with solderless lugs or lug screws.
 4. Sealing Fittings: Threaded type conduit seal fittings and sealing compound suitable for hazardous location installations in accordance with CEC:
 - a. Crouse-Hinds retrofit sealing fitting EYSR.
 - b. Crouse-Hind CHICO A sealing compound.

2.4 ELECTRICAL METALLIC TUBING AND FITTINGS

- A. Type EMT: Electrogalvanized steel tubing.
- B. Fittings and Conduit Bodies:
 - 1. General: In-line straight-through steel or malleable iron fittings and Type C conduit bodies only; do not use bends or tees, e.g. Lbs.
 - 2. Wet Areas: Steel compression-type couplings and nipples.
 - 3. Dry Areas: Set screw-type couplings and nipples.
 - 4. Bonding Locknuts: Malleable iron with set screws and lug screws.
 - a. Insulated Bushing: Malleable iron with integral insulated throat, rated for 150C.
 - b. Bonding and Grounding Bushing: Malleable iron with integral insulated throat, rated for 150C, with solderless lugs or lug screws.

2.5 CONDUIT ACCESSORIES

- A. Duct Spacers: Nonmetallic base and intermediate duct spacers with locking keyways designed specifically for use with nonmetallic conduit; e.g., Carlon SNAP-LOC duct spacers for 4-inch diameter conduit with 1-1/2-inch separation.
 - 1. Base Spacer: S288NHN.
 - 2. Intermediate Spacer: S289NHN.
- B. Expansion/Deflection Fittings: Similar to Crouse-Hinds XD expansion/deflection coupling or Appleton DF Series deflection and expansion coupling.
- C. Pulltape: Measuring and pulling tape constructed of synthetic fiber with plastic jacket, printed with accurate sequential footage marks; e.g., George-Ingraham 1/2-inch tape 9216-JK.
- D. Duct Plugs:
 - 1. Aboveground Conduit Openings: Tapered PVC plugs with tab for pulltape; e.g., Carlon 4-inch PVC plugs with pull tab, P258NT.
 - 2. Underground or Underslab Conduit Openings: Removable screwtight compression type duct plugs with wing-nut and corrosion resistant hardware; e.g., Pacific Plastics No. 5900514, George-Ingraham 0605, or Vikimatic P4000WT.

2.6 PENETRATION SEALING SYSTEMS

- A. Firestopping: Provide fire barrier penetration sealing materials as specified in Division 07, Firestopping section.

- B. Duct Water Seal: Products suitable for closing underground and entrance duct openings, where innerduct or cable is installed, to prevent entry of gases, liquids, or rodents into the structure; e.g., SEMCO PR 851.

2.7 TELECOMMUNICATIONS OUTLET BOXES

- A. Sheet Metal Outlet Boxes: Minimum 4-inch square by 2-1/8-inch deep, galvanized steel for use with single-gang plaster rings.
- B. Five Square Outlet Boxes: Minimum 5-inch square by 2-7/8-inch deep with built-in cable management for use with single-or double-gang plaster rings. Randl P/N T-55017 approved.
- C. Nonmetallic Outlet Boxes: Minimum 4-inch square by 2-1/2-inch-deep. Provide gasketed, watertight single-gang cover.
- D. Cast Boxes: 4-inch square by 2-1/8-inch deep cast Feralloy, gasketed single-gang cover, threaded hubs.
- E. Floor Boxes for Installation in Cast-In-Place Concrete Floors: Flush mounted and fully adjustable formed steel as shown on the Drawings. Floor boxes provided by Division 26.
- F. Plaster Rings: Single-gang as shown on the Drawings.

2.8 TELECOMMUNICATION CABINETS AND RACKS

- A. Intermediate Distribution Frame (IDF)
 - 1. Manufacturer: Chatsworth Products, Inc.
 - 2. Model: 12419-724; Description: 24" CUBE iT PLUS, black in color with double swing cabinet with 19" wide EIA rack mount and tinted plexiglas front door.
 - 3. Dimensions: 24"W x 30"D x 24"H
 - 4. Equipped with the following accessories:
 - a. Fan and Filter Kit – Model: 12804-701 + 12805-701, 115-volt, 100CFM
 - b. Power Strip Surge Protected - Model: 12820-707, 20-amp, 120-volt with NEMA 5-20P cord set with six NEMA 5-20R receptacles.

2.9 PULL BOXES

- A. Construction: NEMA Standard No. 250. Type 1 galvanized steel enclosures designed for use as junction boxes and pull boxes with flat screw-applied covers, with or without knockouts, and gray enamel finish.

2.10 INNERDUCT

- A. Outdoor Innerduct: 1-inch inside diameter corrugated, ribbed, or smooth walled, semi rigid PVC or heavy-wall polyethylene tubing.
- B. Indoor Innerduct: 1-inch inside diameter corrugated, ribbed, or smooth walled, semi rigid nonflammable PVC tubing, which meets UL94V-O vertical flame test for general applications.
- C. Plenum-Listed Indoor Innerduct: 1-inch inside diameter corrugated walled innerduct for use in plenum air handling spaces.
- D. Indoor plenum-rated fabric innerduct with pull string. Maxcell or approved equivalent.

2.11 INNERDUCT FITTINGS

- A. Couplings: Metallic or nonmetallic quick-connect, reverse threaded, and Schedule 40 couplings for connecting sections of installed innerduct.
- B. Conduit Plugs: Compression-type conduit plugs with locking nuts for sealing and securing the outside walls of one or more innerduct ends to the inside wall of 4-inch inside diameter conduits, e.g.:
 - 1. Four 1-inch innerduct configuration.
 - 2. Three 1-1/4-inch innerduct configuration.
- C. Innerduct Plugs: 1-inch and 1-1/4-inch compression-type innerduct plugs for sealing innerducts, with wing nut for hand tightening and eyebolt for securing pulltape.
- D. Innerduct Caps: Removable push-in caps for plugging 1-inch and 1-1/4-inch innerduct.

2.12 WIRE BASKET RUNWAY

- A. Tray sizes have 4-inch side height.
- B. Supply straight sections in standard 120-inches, except where shorter lengths are permitted to facilitate tray assembly lengths as shown on Drawings.
- C. Tray Widths: 12-inches.
- D. Make splice plates the fast splice type as indicated below for each tray type.
 - 1. Make splice plates of yellow zinc dichromate steel.
 - 2. Furnish splice plates with straight sections and fittings as required by manufacturer.
 - 3. Finish: Electro zinc.
- E. Wire Basket Runway Supports: Trapeze style supports.

- F. Materials and Finish: Continuous steel welded and formed wire mesh, electro zinc finish.
- G. Loading Capacities: Wire basket runways to meet NEMA Class Designations.
- H. Manufacturers: Subject to compliance with these Specifications, install wire basket runway.
- I. Cablofil, B-Line, Wiremaid, MonoSystems or approved equivalent.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Provide, condition, apply, install, connect, and test manufactured products, materials, equipment, and components in accordance with the manufacturer's specifications and printed instructions.
- B. The installation of system components to be carried out under the direction of qualified personnel. Appearance to be considered as important as mechanical and electrical efficiency.
- C. Workmanship to meet or exceed industry standards.
- D. Place support for framing, raceways, cable trays, backboards, equipment racks, and cabinets.

3.2 PROTECTION DURING CONSTRUCTION

- A. Protect products from the effects of moisture, corrosion, and physical damage during construction. Except during installation activity in a section, keep openings in conduit, tubing, and wireway capped with manufactured seals during construction.

3.3 MINIMUM CONDUIT SIZE

- A. 4-inch for underground applications unless otherwise indicated on the Drawings.
- B. Size recessed conduits to surface raceway serving multiple data outlets as follows. Sizing is based on TIA/EIA 569-B for 28 percent conduit fill, assuming Category 5e cables (nominal outer diameter 0.24-inch) to each data outlet. Provide recessed backbox between surface raceway and recessed conduit sized for conduit.

1 to 6 cables	1-inch conduit
7 to 10 cables	1-1/4-inch conduit
11 to 15 cables	1-1/2-inch conduit

16 to 20 cables	2-inch conduit
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Above 20 cables: Use multiple runs of conduit from surface raceway based on above table

3.4 MINIMUM BACKBONE CONDUIT REQUIREMENTS

- A. Install three 4-inch conduits from MER to each TR, unless otherwise noted on Drawings.

3.5 CONDUIT TYPE TO BE USED

- A. Install the following types of circular communications raceway in the locations listed unless otherwise indicated on the Drawings.
 - 1. Interior Dry Locations, Exposed: EMT with set screw fittings.
 - 2. Interior Dry Locations, Concealed (Not Embedded in Concrete): EMT with set screw fittings.
 - 3. Interior Wet Locations: EMT with compression fittings.
 - 4. Exterior, Exposed Including Roof: Rigid steel conduit.
 - 5. Exterior, Underground: PVC Schedule 40 Conduit.
 - 6. Concrete-Encased Duct Banks:
 - a. PVC Schedule 40 conduit.
 - b. Rigid steel conduit when additional protection is required.
 - c. Flexible Conduit (Interior Exposed):
 - d. Liquidtight flexible metal conduit for use with copper cable.
 - e. Liquidtight flexible nonmetallic conduit for use with fiber optic cable.

3.6 CONDUIT BENDS AND SWEEPS

- A. Make changes in direction of communications conduit runs with sweeps of the longest possible radius.
- B. Make sweeps in parallel or banked runs of conduits, 2-inches and larger in diameter, from the same center or centerline so that sweeps are parallel and of neat appearance.
- C. Field-Made Bends and Sweeps:
 - 1. Use an acceptable hickey or conduit-bending machine.
 - 2. Do not heat metal raceways to facilitate bending.
 - 3. Before installing 4-inch field-made sweeps in duct banks, pull a 3-1/2-inch diameter by 12-inch long mandrel through duct sections to verify circularity and sweep radius.

- D. The angular sum of the bends between pull points and/or pull boxes to not exceed 180 degrees.
- E. Minimum Inside Bend Radius for Communications Conduit Bends, Sweeps, Boxes, and Fittings:
 - 1. Underground or Underslab 4-inch Conduit: 60-inches.
 - 2. Other Conduit Runs:
 - a. One-inch conduit, 11-inches.
 - b. Two-inch conduit, 21-inches.
 - c. Three-inch conduit, 31-inches.
 - d. Four-inch conduit, 40-inches.
 - e. Other sizes, 10 times the inside diameter of the conduit.
- F. Do not install boxes, bends, elbows, tees, conduit bodies, and other conduit fittings, which do not provide for the minimum inside cable bend radius specified in paragraph E above.
 - 1. Conduit Bodies: In-line straight-through Type C conduit fittings can be used as pull boxes for conduit up to a maximum of 2-inches ID. Other conduit fittings, which include direction changes such as E, L, LB, LR, LL, LRT, TA, TB, and X, are not allowed.
 - 2. Refer design or installation conflicts with these requirements to the Architect.

3.7 PENETRATIONS

- A. Seal conduit entering structures at the first box or outlet to prevent the entrance of gases, liquids, or rodents into the structure.
 - 1. Empty Conduits: Removable screwtight duct plugs.
 - 2. Innerduct Installed: Suitable duct water seal between conduit and innerduct. Manufactured seals in empty innerduct.
 - 3. Cable Installed: Suitable duct water seal between conduit and cable, or between innerduct and cable.
- B. Concrete Sleeves: Conduits routed perpendicular through floors, walls, or other concrete structures to pass through cast-in-place conduit sleeve openings wherever possible, or appropriate size holes to be bored to accommodate the installation of conduit sleeves. The size and location of the holes to not impair the structure's integrity.
 - 1. Concrete Boring: Bore a hole in the concrete with a diameter of 1/2 to 1-inch larger than the conduit sleeve to be installed. Grout around the conduit sleeve and finish to match existing surroundings.
 - 2. Conduits that rise vertically through a slab to be stubbed 6-inches above the floor and capped pending future use.

- C. Drywall/Gypsum Board Sleeves: Install insulating throat bushings on both ends of conduit sleeves placed in fire-rated walls using drywall construction.
- D. Where conduit enters a structure through a concrete roof or membrane waterproofed wall or floor:
 - 1. Provide a watertight seal.
 - 2. With Concrete Encasement: Install watertight entrance seal device on the accessible side.
 - 3. Securely anchor malleable iron body of watertight entrance seal device into construction with one or more integral flanges.
 - 4. Secure membrane waterproofing to watertight entrance seal device in a permanent, watertight manner.
- E. Provide continuous sleeving through walls, floors and ceilings separating each data outlet from its respective MER/TR room, using sleeve conduit size as required on Drawings. Restore penetrations through rated assemblies to original fire rating per NFPA and local codes.
- F. Locate sleeves as shown on Drawings. Where sleeves are not shown on Drawings, install sleeves above suspended ceilings, and locate to minimize length of pathway for future cable from data outlet to MER/TR rooms.
- G. Where sleeves are routed between rooms with floating ceilings, extend conduits horizontally 2-feet over edge of floating ceiling to avoid exposed cabling from being seen at floor level.
- H. Make floor penetrations no more than 4-inches from wall. Install conduit stubs to extend 4-inches from floor base. Cap conduits for protection.

3.8 ABOVE-GROUND CONDUIT INSTALLATION

- A. Support conduit installed in aboveground interior and exterior locations at a maximum of 7-feet on center.
- B. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps.
- C. Securely attach aboveground conduit under the provisions of this Section.
- D. Conceal conduit in finished areas, leave exposed in unfinished areas and where not possible to conceal. In finished areas, the Architect will make the final decision on conduit concealment.
- E. Run exposed and concealed conduits parallel or perpendicular to walls, structural members, or intersections of vertical planes to maintain headroom and provide a neat appearance. Follow surface contours as much as possible.

- F. No section of conduit located within buildings to exceed 100-feet in length between pull points and/or pull boxes.
- G. Expansion/Deflection Joints:
 - 1. Where indicated on the Drawings, provide specific purpose expansion/deflection fittings for conduit crossing building expansion/deflection joints in structures or concrete slabs.
 - 2. Expansion fittings to have copper bonding jumper.
 - 3. For PVC conduit, provide expansion/deflection joints for 25 degrees F maximum temperature variation. Install in accordance with manufacturer's instructions.
 - 4. For rigid steel conduit located in exterior areas, provide expansion/deflection joints for maximum site temperature variation, installed in accordance with manufacturer's instructions.
- H. Provide each conduit passing from a nonhazardous or noncorrosive area to a hazardous area and each conduit entering an enclosure within a hazardous area with a sealing fitting in accordance with NEC Article 500. The sealing fitting to be UL listed and to be filled with approved sealing compound of the same manufacture.
- I. Hubs, Bushings, and Insulating Sleeves:
 - 1. Interior Box and Cabinet Connections: Install insulating throat connectors wherever conduit terminates in boxes or cabinets. In addition, install bonding type locknuts at metallic conduit terminations.
 - 2. Wet Box and Cabinet Connections: Use watertight threaded conduit sealing hubs with insulated throat and bonding type locknuts for fastening rigid steel conduit to cast or sheet metal pull boxes.
 - 3. Exposed Conduit Terminations: Cap exposed steel communication conduit ends with bushings or smooth collars to protect cable sheath.
- J. Flexible Conduit:
 - 1. Make no bends in flexible conduit that exceed allowable bending radius of the cable to be installed or that significantly restricts the conduit's flexibility.
 - 2. A flexible conduit section to be long enough to allow the item to which it is connected to be withdrawn or moved off its base.
 - 3. For final connection to TO's or equipment, where flexible connection is required to minimize vibration or where required to facilitate removal or adjustment of equipment, provide 12-foot minimum lengths of flexible conduit or as indicated on the Drawings.

3.9 PULLTAPE AND DUCT PLUGS

- A. Following conduit installation, install pulltape (muletape) with preprinted foot markers in each empty conduit containing a bend or over 10-feet in length, except sleeves, nipples. Tie the pulltapes securely to duct plug or wall racking at each end.
- B. Immediately after pulltape installation, install removable manufactured plugs in empty conduit and wireway openings. For underground conduit openings, use screwtight, removable, watertight, and dust-tight duct plugs.
- C. Verify lengths at the time of installation and provide as-built documentation.

3.10 WIREWAY TYPE TO BE USED

- A. Install the following types of wireway in the locations listed unless otherwise indicated on the Drawings:
 - 1. Interior, Exposed: Steel.
 - 2. Interior, Concealed: Not approved.
 - 3. Exterior, Exposed: Steel or nonmetallic.

3.11 WIREWAY INSTALLATION

- A. Install wireway, as indicated on the Drawings.
- B. Securely support wireways at intervals not to exceed 5-feet and at each end or joint for individual sections.
- C. Attach wireways and related materials under the provisions of this Section.
- D. Run exposed wireways parallel or perpendicular to walls, structural members, or intersections of vertical planes to maintain headroom and provide a neat appearance.
- E. Close dead ends of wireway with fittings by the same manufacturer.
- F. Gasket each joint if in oiltight gutter.
- G. Mount raintight gutter in horizontal position only.
- H. Maintain grounding continuity between raceway components to provide a continuous grounding path.

3.12 TELECOMMUNICATIONS OUTLET BOX INSTALLATION

- A. Provide 4-inch by 4-inch by 2.5-inch deep outlet boxes for mounting telecommunications outlets with single-or double-gang plaster rings as required, or as indicated on the Drawings.

- B. Do not install outlet boxes back to back in walls. Provide minimum 6-inch separation, except provide minimum 24-inch separation in acoustic-rated walls.
- C. Locate outlet boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for outlet boxes. Use boxes with sufficient depth to permit conduit hubs to be located in masonry void spaces.
- D. Provide knockout closures for unused openings.
- E. Support telecommunications outlet boxes independently of conduit.
- F. Use multiple-gang boxes where more than one device is mounted together; do not use sectional outlet boxes.
- G. Install outlet boxes in walls without damaging wall insulation.
- H. Coordinate mounting heights and locations of outlet boxes mounted above counters, benches, and backsplashes.
- I. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlet boxes in hollow stud wall.
- J. Provide cast outlet boxes in exterior and wet locations.

3.13 RACEWAY IDENTIFICATION BANDING

- A. Degrease and clean surfaces to receive tape labels.
- B. Exposed conduits and wireway, including raceways above lay-in or accessible ceilings, together with associated pull boxes to be banded at intervals of not over 10-feet and at direction changes. Two-band identification to be different contrasting colors as follows:

Raceway Use	Color
Grounding	Green
Building fire alarm system/voice evacuation	Red
Telecom/Datacom	Yellow
Facility management system (FMS) and general control circuitry	Blue and Black
CCTV	White
Building monitoring and security	Grey
Controls (non-FMS)	Brown and White

3.14 WIRE BASKET RUNWAY INSTALLATION METHODS

- A. Cut standard straight sections of materials to length in the field.
- B. Deburr and file rough edges and cut sections.
- C. Locations shown on the Drawings are approximate unless dimensioned.
- D. Install as shown on the Drawings and securely attach under the provisions of this Section.
- E. Entire length of wire basket runway to be accessible.
- F. Maintain minimum 6-inch clearance between cable tray and piping. Locate a minimum of 12-inches away from heat sources such as parallel runs of flues, steam or hot water pipes, and heating appliances.
- G. Run exposed and concealed cable tray parallel or perpendicular to walls, structural members, or intersections of vertical planes to maintain headroom and provide a neat appearance.
- H. Do not obstruct passageways.
- I. Route wire basket runway within the assigned communications utility space.
- J. Install appropriate cable tray bends, dropouts, and other accessories to protect minimum cable bend radius and provide adequate support at locations where cable direction changes occur.

3.15 PENETRATIONS

- A. Provide removable heat-expanding pillows at fire barrier penetrations as specified in Firestopping section, and described as Firestop Material Type 7 (indicated as FSM-7).

3.16 INNERDUCT TYPE TO BE USED

- A. Underslab and Underground Conduit Installation: Outdoor or indoor innerduct.
- B. Aboveground, Exterior, and Interior Conduit Installations: Indoor innerduct.
- C. Interior Exposed Locations Including Cable Tray Installations:
 - 1. Nonplenum Areas: Indoor innerduct.
 - 2. Plenum Areas: Plenum-listed innerduct.

3.17 INNERDUCT INSTALLATION

- A. Pull innerduct through conduit and wireways, or place innerduct in cable trays using continuous unspliced lengths of innerduct between pull boxes, and/or section termination points as indicated on the Drawings.
- B. Cut innerduct square. Deburr cut ends.
- C. Bring innerduct to the shoulder of fittings and couplings and fasten securely.
- D. Wipe innerduct and fittings clean and dry before joining. Apply full, even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.
- E. Provide suitable innerduct slack in pull boxes, and at turns to ensure that there is no kinking or binding of the cable.
- F. Make changes in direction of communications innerduct runs with sweeps of the longest possible radius and at least 10 times the inside diameter of the innerduct.
- G. During innerduct pulling, avoid excessive tension which can damage the innerduct. Inspect innerduct following placement and replace damaged sections.
- H. Indoor Conduit Installation:
 - 1. Arrange innerduct neatly, cut to proper length, and remove surplus. Provide trained and bundled innerduct pigtails extending at least 18-inches beyond exposed conduit openings.
 - 2. At locations where the ends of innerduct sections appear in a pull box, join the pulltape and then splice innerduct sections together using couplers which do not reduce the inside diameter of the innerduct.
- I. Cable Tray Installation: Velcro innerduct to one side of vertical ladder rack every 2-feet minimum, and to one side of horizontal ladder-type cable tray every 5-feet minimum.
- J. Following installation, visually inspect innerduct, remove burrs at openings, and, if necessary, clean innerduct interior.
- K. Use factory pulling eye to prevent twisting of innerduct and cable.

3.18 PULLTAPE AND DUCT PLUG INSTALLATION

- A. Following innerduct installation, install pulltape (muletape) with preprinted foot markers in innerduct sections. Tie the pulltape securely at each end.
- B. Verify lengths at the time of installation and provide as-built documentation.
- C. Following innerduct and pulltape installation, cap or plug innerduct with manufactured seals to prevent moisture or foreign matter from entering until cable installation starts. Seal duct openings in underground or underslab innerduct sections immediately after installation using screwtight, removable, watertight, and dust-tight duct plugs.

3.19 GROUNDING

- A. Provide ground connections and bonding continuity between raceway and wire basket runway sections, boxes, enclosures, cabinets, and fittings as required per code and industry standard.

END OF SECTION

SECTION 271300
COMMUNICATIONS BACKBONE CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Work included: Materials, installation and testing of:

1. Fiber Optic Backbone Cable
2. Copper Termination Hardware
3. Fiber Optic Termination Hardware
4. Copper Patch (Jumper) Cords
5. Fiber Optic Patch (Jumper) Cords
6. Splice Cases

1.2 RELATED SECTIONS

A. Contents of Division 27 and Division 01, General Requirements apply to this Section.

1.3 REFERENCES AND STANDARDS

- A. References and Standards as required by Section 27 00 00 and Division 01, General Requirements.
- B. In addition, meet the following:
1. NFPA 780, Standards for Installation of Lightning Protection Systems.

1.4 SUBMITTALS

- A. Submittals as required by Section 27 00 00 and Division 01, General Requirements.
- B. In addition, provide:
1. Shop Drawings that include, but are not limited to, the following: Telecommunication Room layout, Telecommunication Room wall elevations, equipment rack elevations, cable routing, cable connecting diagrams, termination pin outs, supporting hardware details, block diagrams, riser diagrams and cable pathways. Work may not begin until shop drawings are approved. Note: Intent of submitting shop drawings is for contractors to display a conceptual understanding of the issued Engineer drawings. Do not submit Engineer Drawings on your title block.

2. Procedures for cable labeling and identification, long term documentation methods and numbering scheme in accordance with ANSI/TIA/EIA-606-A.
3. A copy of certified installer certificates and warranty certificates for products proposed.

1.5 QUALITY ASSURANCE

- A. Quality assurance as required by Section 27 00 00 and Division 01, General Requirements.
- B. In addition, meet the following:
 1. Manufacturers to have a recognized certified installer program in place for system components proposed. Cable will be approved with manufacturer system installed.

1.6 WARRANTY

- A. Warranty of materials and workmanship as required by Section 27 00 00 and Division 01, General Requirements.
- B. In addition, provide:
 1. Labor, materials, and documentation according to Panduit/General manufacturer requirements necessary to ensure that the Owner will be furnished with an Extended Product Warranty and Application Assurance of a minimum of 25 years in length. The Application Assurance Warranty will cover the failure of the wiring system to support current or future applications that are designed for the link/channel specifications of ANSI/TIA/EIA-568-C. These applications include, but are not limited to, 10BASE-T, 100BASE-T, 1000BASE-T, 10GBASE-T, and 155 Mb/s ATM.
 2. Provide a warranty on the physical installation.
 3. Furnish necessary documentation required by Panduit/General immediately following 100 percent testing of cables.
 4. Administer the warranty process with the responsible Panduit/General representative. Provide warranty directly to the Owner from the manufacturer. Ensure that the manufacturer provides the Owner with the appropriate warranty certification within 90 calendar days of the final project completion.

1.7 SYSTEM DESCRIPTION

- A. Provide a standards-based cable system to serve backbone communication systems requirements as specified in these specifications and shown on Drawings. Closely follow ANSI/TIA/EIA, IEEE and ISO standards which apply to backbone communication systems.

- B. Install intrabuilding backbone cables from ER-s to TR's through raceway systems as shown on Drawings.
- C. Install interbuilding (OSP) backbone cables from EF to ER's through duct and tunnel raceway systems as shown on Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide like items from one manufacturer, such as jacks, patch panels, equipment connection cords, and wall plates. The following manufacturers/solutions are preapproved.
 - 1. ADC
 - 2. Belden
 - 3. BTR Netcom
 - 4. Commscope
 - 5. Corning -fiber optic only
 - 6. Leviton
 - 7. Ortronics/Berk-Tek
 - 8. General or Panduit
 - 9. Mohawk or Siemon

2.2 FIBER OPTIC BACKBONE CABLE

- A. Intrabuilding Singlemode Riser: 12-strand, 8.3-micron, high performance low water peak distribution cable with maximum attenuation of .35dB/km at 1310 nm and .25dB/km at 1550 nm. OFNR rated.
- B. Intrabuilding Singlemode Plenum: 12-strand, 8.3-micron, high performance low water peak distribution cable with maximum attenuation of .35dB/km at 1310 nm and .25dB/km at 1550 nm. OFNP rated.
- C. Interbuilding: Singlemode: 24-strand, 8.3-micron, high performance low water peak loose tube cable with maximum attenuation of .35dB/km at 1310 nm and .25dB/km at 1550 nm. Cable will be hybrid under one jacket. Corning or approved equal.
- D. General: between MDF and IDF: 24-strand singlemode 8.3-micron, high performance cable with maximum attenuation of .35dB/Km at 1310 nm and .25dB/Km at 1550 nm. Cable will be hybrid under one jacket. Corning or approved equal.

2.3 FIBER OPTIC TERMINATION HARDWARE

A. High Density Fiber Termination Shelf:

1. 7-inch-high shelf designed for mounting in 19-inch equipment racks and capable of accepting 12 adapter panels. The shelf will contain built-in slack management and be accessible from the front or rear with locking doors.
 - a. 19-inch Rack Mount, 13-inches deep
 - b. 19-inch rack mount, 19-inches deep
2. 3.5-inch-high shelf designed for mounting in 19-inch equipment racks and capable of accepting 6 adapter panels. The shelf will contain built-in slack management and be accessible from the front or rear with locking doors.
 - a. 19-inch Rack Mount, 13-inches deep
 - b. 19-inch rack mount, 19-inches deep
3. Fiber Adapter Panels:
 - a. Adapter panel for high density termination shelf with 6 LC multimode phosphor-bronze alignment sleeves.
4. Preloaded Fiber Termination Shelf:
 - a. 1.75-inch-high shelf designed for mounting in 19-inch equipment racks with 12 LC multimode phosphor-bronze alignment sleeves. The shelf will contain built-in slack management and be accessible from the front or rear.
 - b. 1.75-inch-high shelf designed for mounting in 19-inch equipment racks with 24 LC multimode phosphor-bronze alignment sleeves. The shelf will contain built-in slack management and be accessible from the front or rear.

B. Singlemode LC Connector:

1. Ceramic tip LC style capable of being terminated on 8.3/125 fiber with 900-micron buffer.

2.4 FIBER OPTIC PATCH (JUMPER) CORDS

A. Singlemode Fiber Optic Jumpers:

1. Factory terminated double ended, two-strand singlemode cordage with LC connectors on each end, length as defined by the Owner.

2.5 SPLICE CASES

- ### A. Fiber Optic:
- Provide as close as practicable (within 50-feet) of where OSP cable enters building in a duct or conduit system. Size splice cases(s) to accommodate strand count of the cable(s) entering building. Splice case must be capable of bonding to the Telecommunications Main Grounding Bus Bar (TMGB). Complete with end caps to

properly seal cable from expanding water blocking gel. Approved manufacturers: Preformed, Corning, and 3M.

2.6 MISCELLANEOUS HARDWARE

- A. Provide supporting hardware, cable ties, labels, underground vault racking, bullet bonds, gel blocking kits, pull rope, and other miscellaneous hardware for a complete and operable system.

PART 3 - EXECUTION

3.1 GENERAL

- A. Communications Backbone Cabling includes cables, jacks, patch panels, connecting blocks, and patch cords, as well as the necessary support systems, such as cable managers, tie wraps, and D-rings.
- B. Furnish and install materials necessary for a complete and working system.
- C. Contractor must be a Certified Installer for selected manufacturer prior to, during, and through completion of the system installation, and must be able to provide the manufacturer's extended warranty.
- D. Perform work in a neat and workmanlike manner.
- E. Install cable after interior of building has been physically protected from the weather and mechanical work likely to damage cabling has been completed.
- F. Before installing cabling, ensure cable pathways are completely and thoroughly cleaned:
 - 1. Inspect conduit, wireway, cable trays, and innerduct systems prior to installation.
 - 2. Swab any additional enclosed raceway and innerduct systems.
- G. Provide protection for exposed cables where subject to damage. Provide abrasion protection for any cable or wire bundles, which pass through holes or across edges of sheet metal.
- H. Install cable ties and other cable management clamps via hand so that it fits snugly. Do not over tighten or use mechanical tools which could compress, crimp, or otherwise change the physical characteristics of the cable jacket or distort the placement of twisted-pair components. Replace any cable exhibiting stresses due to over tightening of cable management devices.
- I. Where possible, route cables in overhead cable trays and inside wire management systems attached to the equipment cabinets and racks. Use Velcro ties or ducts to restrain cabling installed outside of wire management systems on racks or in cabinets.

- J. Co-install a pull cord (nylon; 1/8-inch minimum) with cable installed in conduit.
- K. Limit cable raceway fill to less than the TIA/EIA-569-B maximum fill for the particular raceway type.
- L. If a J-hook or trapeze system is used to support cable bundles, support cables at a maximum of 48 to 60-inch intervals. Cables are prohibited to rest on acoustic ceiling grids or panels.
- M. Cable sizes are shown on Drawings. Verify that as a minimum, two cable pairs are provided for each telephone user outlet. Install specified fiber optic cable between TRs as shown on drawings.
- N. Install cable above fire-sprinkler systems and ensure that the cable does not attach to the system or any ancillary equipment or hardware. Install cable system and support hardware such that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
- O. Do not attach cables to ceiling grid or lighting fixture wires. Where support for cable is required, install appropriate carriers to support the cabling.
- P. Any cable damaged or exceeding recommended installation parameters during installation will be replaced by the contractor prior to final acceptance at no cost to the Owner.
 - 1. Install cable in accordance with manufacturer's recommendations and best industry practices.
 - 2. Install cables in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.
 - 3. Install transition points or consolidation points in accessible locations and housed in an enclosure intended and suitable for the purpose, where allowed by standards and approved by the Owner's representative.
 - 4. Do not exceed the cable's minimum bend radius and maximum pulling tension.
 - 5. Install unshielded twisted pair cable so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.
 - 6. Do not exceed 25-lbf pulling tension on 4-pair UTP cable.
- Q. Splice Case Installation: Provide splice cases within 50-feet of where OSP cable enters building in a duct or conduit system. Size splice cases to accommodate pair or strand count of cable entering building. Properly bond cable entering and exiting splice case to Main Telecommunication Grounding Bus Bar (TMGB). Install end caps to properly seal cable from expanding water blocking gel.
- R. Determine requirements for plenum rated cable and devices. When doubt exists, seek prior determination in writing by AHJ.

- S. Seal conduits entering from outside the building and install listed firestop material in conduits and sleeves to satisfy CEC and local codes.
- T. Dress and terminate cables in accordance with the recommendations made in the ANSI/TIA/EIA-568-C.1 document, manufacturer's recommendations and best industry practices.
- U. Terminate 4 pair cables on the jack and patch panels using T568A wiring scheme.
- V. Maintain the cable jacket within 1-inch of the termination point.
- W. Do not exceed 0.5-inch of pair untwist at the termination point.
- X. Do not exceed 4 times the outside diameter of the cable in the termination area for bend radiance compliance.
- Y. Neatly bundle and dress cables to their respective panels or blocks. Feed each panel or block by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

3.2 OPTICAL FIBER CABLE INSTALLATION PRACTICES

- A. Place fiber optic cable so as to maintain the minimum cable bend radius limits specified by the manufacturer or ten times the cable diameter, whichever is larger.
- B. Place fiber optic cable runs in innerduct. Use care when handling fiber optic cable. Carefully monitor pulling tension so as not to exceed the limits specified by the manufacturer.
- C. Terminate fiber optic cable in rack-mounted fiber optic terminated units at each end using standard SC style bulkhead connectors.
- D. Splicing of fiber optic cable is prohibited unless directed in drawings or approved via RFI.

3.3 TESTING PROCEDURES

- A. Test cables and termination hardware for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-C.
- B. Verify pairs of each installed cable prior to system acceptance. Repair or replace any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks in order to ensure 100 percent useable conductors in cables installed.
- C. Test cables in accordance with this document, the ANSI/TIA/EIA standards, the manufacturer's procedures and best industry practice. If any of these are in conflict, bring any discrepancies to the attention of the project team for clarification and resolution.

1. The cable length will conform to the maximum distances set forth in the ANSI/TIA/EIA-569-C standard. Record cable lengths, referencing the cable identification number and circuit or pair number. For multi-pair cables, record the shortest pair length as the length for the cable.
2. Follow the Standards requirements established in ANSI/TIA/EIA-568-C.
3. Perform testing with a Level IV tester.
4. The basic tests required are:
 - a. Wire Map
 - b. Length
 - c. Attenuation
 - d. NEXT (Near end crosstalk).
 - e. Return Loss
 - f. ELFEXT Loss
 - g. Propagation Delay
 - h. Delay skew
 - i. PSNEXT (Power sum near-end crosstalk loss).
 - j. PSELFEXT (Power sum equal level far-end crosstalk loss).
 - k. Provide test results in written format, with the following minimum information per cable:
 - l. Circuit ID
 - m. Test result, "Pass" or "Fail"
 - n. Date and Time of test
 - o. Project Name
 - p. NVP
- D. Provide an electronic copy of the test results, in the native tester software format, to the Consultant along with the written test results.
- E. Provide a fully functional version of the tester software for use by the Consultant in reviewing the test results.
- F. Any failed test results that cannot be remedied through re-termination (as in the case of reversed or split pairs), must be reported in writing to the Consultant immediately, along with a copy of the test results.
- G. Labeling:
 1. Label cables using a machine printed label at each end of the cable at approximately 12 inches of the termination point, and again at approximately 48-inches from the termination point. Do not use handwritten labels.

2. Label patch panel ports with the cable identifier.
3. Provide the final cable ID matrix to the Architect one week prior to cable installation.
4. Note labeling information on the as-built drawings.

3.4 PATCH CORDS

- A. Fiber Optic: Provide sufficient duplex fiber optic jumpers (patch cords) at each fiber termination point to cross-connect one-half the number and type of fibers terminated there. Assume a minimum of 2 duplex fiber optic jumpers per termination point for a 6-strand optical fiber.
- B. Provide lengths for a neat appearance not to exceed 15-feet. Some jumpers may require LC to SC, or SC to ST connections to support existing or readily available hardware. Coordinate connector requirements with Owner.
- C. Field terminated patch cords and jumpers are not allowed.

END OF SECTION 271300

SECTION 271500
COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Work included: Provision of materials, installation and testing of:

1. Station Cabling
2. Modular Jacks/Adapters
3. Work Area Outlets
4. Termination Block
5. Patch Panels

1.2 RELATED SECTIONS

A. Contents of Division 27 and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:

1. Use this Section in conjunction with other Division 27 specifications and related Contract
2. Documents to establish the total general requirements for the project communications systems and equipment.

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 27 00 00 and Division 01, General Requirements.

B. In addition, meet the following: NFPA 780, Standard for the Installation of Lightning Protection Systems.

1.4 SUBMITTALS

A. Submittals as required by Section 27 00 00 and Division 01, General Requirements.

B. In addition, provide:

1. Shop Drawings that include, but are not limited to, the following: Telecommunication Room layout, Telecommunication Room wall elevations, equipment rack elevations, cable routing, cable connecting diagrams, termination pin outs, supporting hardware details, block diagrams, riser diagrams, cable pathways. Work may not begin until shop drawings are approved. Note: Intent of submitting shop drawings is for contractors to display a conceptual understanding of the issued Engineer drawings. Do not submit engineers drawing on your title block.
2. Procedures for cable labeling and identification, long term documentation methods and numbering scheme in accordance with ANSI/TIA/EIA-606A.
3. A copy of certified installer certificates and warranty certificates for products proposed.

1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 27 00 00 and Division 01, General Requirements.

B. In addition, meet the following:

1. Manufacturers to have a recognized certified installer program in place for system components proposed. Cable will be approved with manufacturer system installed.

1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 27 00 00 and Division 01, General Requirements.

B. In addition, provide:

1. Labor, materials and documentation according to selected manufacturer requirements necessary to ensure that the Owner will be furnished with an Extended Product Warranty and Application Assurance of a minimum of 20 years in length. The Application Assurance. Warranty will cover the failure of the wiring system to support current or future applications that are designed for the link/channel specifications of ANSI/TIA/EIA-568-C.1. These applications include, but are not limited to, 10BASE-T, 100BASE-T, 1000BASE-T, 10GBASE-T and 155 Mb/s ATM.
2. A warranty on the physical installation.
3. Necessary documentation required by the manufacturer immediately following 100 percent testing of cables.

C. Administer the warranty process with the responsible manufacturer's representative. Provide warranty directly to the Owner from the manufacturer. Ensure that the

manufacturer provides the Owner with the appropriate warranty certification within 90 calendar days of the final project completion.

1.7 SYSTEM DESCRIPTION

- A. Provide a standards-based cable system to serve horizontal communication systems requirements as specified and as shown on Drawings. Closely follow ANSI/TIA/EIA, IEEE and ISO standards.
- B. The horizontal distribution subsystem refers to intra-building twisted-pair and fiber optic communications cabling connecting telecommunications rooms (TRs) to telecommunications outlets (TOs) located at individual work areas and consists of the following:
 - 1. Category 6a 100 Ohm, 4-pair, unshielded twisted pair cables from the TRs to the TOs.
 - 2. The horizontal system includes cables, jacks, patch panels, connecting blocks, patch cords, fiber connectors and jumpers as well as the necessary support systems, such as cable managers and faceplates.
 - 3. Cables are routed through conduit, spaces below raised floors, open ceiling areas, nonventilated spaces above ceiling tile, and through plenum air-handling spaces above ceiling tile.
 - 4. Furnish and install materials necessary for a complete and working system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide like items from one manufacturer, such as jacks, patch panels, equipment connection cords, and wall plates. The following manufacturers/solutions are preapproved.
 - 1. ADC
 - 2. Belden
 - 3. BTR Netcom
 - 4. Commscope
 - 5. Corning -fiber optic only
 - 6. Leviton
 - 7. Ortronics/Berk-Tek
 - 8. General or Panduit
 - 9. Mohawk or Siemon

10. Tyco AMP NETCONNECT

2.2 STATION CABLING

A. 50 Micron Optical Fiber Cable:

1. Laser-optimized 50/125- μ m fiber optic building cable with nonmetallic construction, a core of individually tight buffered fibers, and listed OFNR. Minimum bandwidth of 1500 MHz-km at 850nm for overfilled launch, 500 MHz-km at 1300nm and 2000 MHz-km characterized using FOTP 220.
 - a. Two Strand
 - b. Four Strand
 - c. Six Strand
2. Laser-optimized 50/125- μ m fiber optic building cable with nonmetallic construction, a core of individually tight buffered fibers, and listed OFNR. Minimum bandwidth of 500 MHz-km at 850nm and 500 MHz-km at 1300 nm.
 - a. Two Strand
 - b. Four Strand
 - c. Six Strand
3. Laser-optimized 50/125- μ m fiber optic building cable with nonmetallic construction, a core of individually tight buffered fibers, and listed OFNP. Minimum bandwidth of 1500 MHz-km at 850nm for overfilled launch, 500 MHz-km at 1300nm and 2000 MHz-km characterized using FOTP 220.
 - a. Two Strand
 - b. Four Strand
 - c. Six Strand
4. Laser-optimized 50/125- μ m fiber optic building cable with nonmetallic construction, a core of individually tight buffered fibers, and listed OFNP. Minimum bandwidth of 500 MHz-km at 850nm and 500 MHz-km at 1300 nm.
 - a. Two Strand
 - b. Four Strand
 - c. Six Strand

2.3 MODULAR JACKS/ADAPTERS

A. Category 6a Modular Jacks:

1. Eight-position modular jack, Category 6a, IDC terminals, T568B wiring scheme
2. Each jack must be stamped or have icons to identify it as CAT 6.
3. Coordinate color with building finishes.

B. Multimode Fiber Modular Adapter:

1. One-strand fiber optic TracJack modular adapter, Simplex SC type connectors, phosphor-bronze alignment sleeves with 180-degree exit
2. One-strand fiber optic TracJack modular adapter, Simplex SC type connectors, phosphor-bronze alignment sleeves with 45-degree exit
3. Two-strand fiber optic TracJack modular adapter, two Simplex SC type connectors,
4. phosphor-bronze alignment sleeves with 180-degree exit

2.4 WORK AREA OUTLETS

A. Flush Mounted Faceplate:

1. Two-port faceplate, constructed from high impact thermo-plastic, with recessed label fields, mounts within a single gang wall box.
2. Four-port faceplate, constructed from high impact thermo-plastic, with recessed label fields, mounts within a single gang wall box.
3. Coordinate faceplate color with building finishes. Submit to Architect for approval prior to installation.

B. Flush Mounted Stainless Steel Faceplates:

1. Two-port stainless steel faceplate, with recessed label fields, mounts within a single gang wall box.
2. Four-port stainless steel faceplate, with recessed label fields, mounts within a single gang wall box.

C. Surface Mounted Outlet Boxes:

1. Two-port surface mount box, constructed from high impact thermo-plastic, with recessed label fields.
2. Four-port surface mount box, constructed from high impact thermo-plastic, with recessed label fields.
3. Coordinate surface box colors with building finishes. Submit to Architect for approval prior to installation.

2.5 TERMINATION BLOCKS

A. Category 6a 110-style Blocks:

1. Category 6a, 288 Pair, 110-style, with mounting legs, wall -mount.
2. Category 6a, 96 Pair, 110-style, with mounting legs, wall -mount.
3. Category 6a, 288 Pair, 110-style, without mounting legs, rack-mount.

4. Category 6a, 96 Pair, 110-style, without mounting legs, rack-mount.

B. Connecting Blocks:

1. 3 Pair 110-style connecting blocks.
2. 4 Pair 110-style connecting blocks.
3. 5 Pair 110-style connecting blocks.

C. Wiring Troughs:

1. Horizontal trough for routing of patch cords and cross-connect wire, with mounting legs.
2. Horizontal trough for routing of patch cords and cross-connect wire, without mounting legs.

D. 110 Block Labels:

1. Clear plastic holder for 110 blocks with paper inserts, for blocks with legs
2. Clear plastic holder for 110 blocks with paper inserts, for blocks without legs

E. Mounting Brackets: 19-inch rack mount brackets for 200 pair 110 termination blocks and wiring troughs.

2.6 PATCH PANELS

A. Category 6a Modular Patch Panels:

1. 24 port, eight-position modular jack panel, high density, 6 port modules, Category 6a, IDC terminals, T568A/B wiring scheme.
2. 48 port, eight-position modular jack panel, high density, 6 port modules, Category 6a, IDC terminals, T568A/B wiring scheme.
3. 24 port, eight-position modular jack panel, high density, 8 port modules, Category 6a, IDC terminals, T568A/B wiring scheme.
4. 48 port, eight-position modular jack panel, high density, 8 port modules, Category 6a, IDC terminals, T568A/B wiring scheme.

B. Universal Patch Panels:

1. 19-inch rack mounted panel with isolation capable of accepting up to 24 modular jacks.
2. 19-inch rack mounted panel capable of accepting up to 24 modular jacks.

2.7 MISCELLANEOUS HARDWARE

- A. Provide supporting hardware, cable ties, labels, underground vault racking, bullet bonds, gel blocking kits, pull rope, and other miscellaneous hardware for a complete and operable system.

PART 3 - EXECUTION

3.1 GENERAL

- A. Horizontal cabling includes cables, jacks, patch panels, connecting blocks, and patch cords, as well as the necessary support systems, such as cable managers and faceplates.
- B. Furnish and install materials necessary for a complete and working system.
- C. Contractor must be a Certified Installer for selected manufacturer prior to, during, and through completion of the system installation, and must be able to provide the manufacturer's extended warranty.
- D. Perform work in a neat and workmanlike manner.
- E. Install cable after interior of building has been physically protected from the weather and mechanical work likely to damage cabling has been completed.
- F. Before installing cabling, ensure cable pathways are completely and thoroughly cleaned.
 - 1. Inspect conduit, wireway, cable trays, and innerduct systems prior to installation.
 - 2. Swab any additional enclosed raceway and innerduct systems.
- G. Provide protection for exposed cables where subject to damage. Provide abrasion protection for any cable or wire bundles, which pass through holes or across edges of sheet metal.
- H. Install cable ties and other cable management clamps via hand so that it fits snugly. Do not over tighten or use mechanical tools which could compress, crimp, or otherwise change the physical characteristics of the cable jacket or distort the placement of twisted-pair components. Replace any cable exhibiting stresses due to over tightening of cable management devices.
- I. Where possible, route cables in overhead cable trays and inside wire management systems attached to the equipment cabinets and racks. Use Velcro ties or ducts to restrain cabling installed outside of wire management systems on racks or in cabinets.
- J. Co-install a pull cord (nylon; 1/8-inch minimum) with cable installed in conduit.
- K. Limit cable raceway fill to less than the TIA/EIA-569-B maximum fill for the particular raceway type.

- L. If a J-hook or trapeze system is used to support cable bundles, support horizontal cables at a maximum of 48-to 60-inch intervals. Cables are prohibited to rest on acoustic ceiling grids or panels.
- M. Bundle horizontal distribution cables in groups of no more than 50 cables. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance.
- N. Install cable above fire-sprinkler systems and ensure that the cable does not attach to the system or any ancillary equipment or hardware. Install cable system and support hardware such that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
- O. Do not attach cables to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, install appropriate carriers to support the cabling.
- P. Any cable damaged or exceeding recommended installation parameters during installation will be replaced by the contractor prior to final acceptance at no cost to the Owner.
- Q. Determine requirements for plenum rated cable and devices. When doubt exists, seek prior determination in writing by AHJ.
- R. Unshielded Twisted Pair Cable Installation Practices:
 - 1. Install cable in accordance with manufacturer's recommendations and best industry practices.
 - 2. Install cables in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.
 - 3. Install transition points or consolidation points in accessible locations and housed in an
 - 4. enclosure intended and suitable for the purpose, where allowed by standards and
 - 5. approved by the Owner's representative.
 - 6. Do not exceed the cable's minimum bend radius and maximum pulling tension.
 - 7. Install unshielded twisted pair cable so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.
 - 8. Do not exceed 25-lbf pulling tension on 4-pair UTP cable.
- S. Provide the following minimum separation distances between pathways for copper communications cables and power wiring of 480 volts or less:
 - 1. Open or Nonmetal Communications Pathways:
 - a. 12-inches from electric motors, fluorescent light fixtures, and unshielded power lines carrying up to 3 kVA.

- b. 36-inches from electrical equipment and unshielded power lines carrying more than 5 kVA.
 - c. 48-inches from large electrical motors or transformers.
- 2. Grounded Metal Conduit Communications Pathways:
 - a. 2 1/2-inches from electrical equipment and unshielded power lines carrying up to 2 kVA.
 - b. 6-inches from electrical equipment and unshielded power lines carrying from 2 kVA to 5 kVA.
 - c. 12-inches from electrical equipment and unshielded power lines carrying more than 5 kVA.
 - d. 3-inches from power lines enclosed in a grounded metal conduit (or equivalent shielding) carrying from 2 kVA to 5 kVA.
 - e. 6-inches from power lines enclosed in a grounded metal conduit (or equivalent shielding) carrying more than 5 kVA.

3.2 UNSHIELDED TWISTED PAIR TERMINATION

- A. Coil cables in the in-wall or surface-mount boxes if adequate space is present to house the cable coil without exceeding the manufacturers bend radius. In hollow wall installations where box-eliminators are used, excess wire can be stored in the wall. Do not store more than 12-inches of UTP and 36-inches of fiber slack in an in-wall box, modular furniture raceway, or insulated walls. Loosely coil and store excess slack in accessible ceiling space above each drop location when there is not enough space present in the outlet box to store slack cable.
- B. Dress and terminate cables in accordance with the recommendations made in the ANSI/TIA/EIA-568-C.1 document.
- C. Terminate 4 pair cables on the jack and patch panels using T568A wiring scheme.
- D. Maintain the cable jacket within 1-inch of the termination point.
- E. Do not exceed 0.5-inch of pair untwist at the termination point.
- F. Do not exceed 4 times the outside diameter of the cable in the termination area for bend radiance compliance.
- G. Neatly bundle and dress cables to their respective panels or blocks. Feed each panel or block by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

3.3 TESTING PROCEDURES

- A. Test cables and termination hardware for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-C.

- B. Verify pairs of each installed cable prior to system acceptance. Repair or replace any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks in order to ensure 100 percent useable conductors in cables installed.
- C. Test cables in accordance with this document, the ANSI/TIA/EIA standards, the manufacturer's procedures and best industry practice. If any of these are in conflict, bring any discrepancies to the attention of the project team for clarification and resolution.
- D. Test Unshielded Twisted Pair Cables as Follows:
 - 1. Test twisted-pair copper cable links for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance. Test horizontal cabling using a Level III test unit for Category 6a performance compliance as specified in ANSI/TIA/EIA-568 C.1, C.2.
 - 2. Continuity -Test each pair of each installed cable using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Test shielded/screened cables with a device that verifies shield continuity in addition to the above stated tests.
 - 3. Record the test as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Correct or repair any faults in the wiring and retest the cable prior to final acceptance.
 - 4. Length -Test each installed cable link for installed length using a TDR type device. Test the cables from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length will conform to the maximum distances set forth in the ANSI/TIA/EIA-568-C Standard. Record cable lengths, referencing the cable identification number and circuit or pair number. For multipair cables, record the shortest pair length as the length for the cable.
- E. Follow the Standards requirements established in ANSI/TIA/EIA-568-C.1, C.2.
- F. Perform testing with a Level IV tester. The basic tests required are:
 - 1. Wire Map
 - 2. Length
 - 3. Attenuation
 - 4. NEXT (Near-end Crosstalk)
 - 5. Return Loss
 - 6. ELFEXT Loss
 - 7. Propagation Delay
 - 8. Delay Skew
 - 9. PSNEXT (Power Sum Near-end Crosstalk Loss)

10. PSELFEXT (Power Sum Equal Level Far-end Crosstalk Loss)

- G. Provide test results in electronic format, with the following minimum information per cable:
1. Circuit ID
 2. Test Result, "Pass" or "Fail"
 3. Date and Time of Test
 4. Project Name
 5. NVP
 6. Cable Length
 7. Tester Name
- H. Provide an electronic copy of the test results, in the native tester software format, to the Consultant along with the written test results.
- I. Provide a fully functional version of the tester software for use by the Consultant in reviewing the test results.
- J. Any failed test results that cannot be remedied through re-termination (as in the case of reversed or split pairs), must be reported in writing to the Consultant immediately, along with a copy of the test results.
- K. Labeling.
1. Label horizontal cables using a machine printed label at each end of the cable at approximately 1 inch from the termination point on each end, approximately 12-inches of the termination point, and again at approximately 48-inches from the termination point. Do not use handwritten labels.
 2. Label patch panel ports and TO ports with the cable identifier.
 3. Denote the TO ID, as well as the unique cable number for that TO, i.e. A-001-A for cable number 1, A-001-B for cable number 2, and so forth on the labels. Provide the final cable ID matrix to the Architect one week prior to cable installation.
 5. Note labeling information on the as-built drawings.

3.4 PATCH CORDS

- A. Field terminated patch cords and jumpers are not allowed. At a minimum, provide equipment connection cords for one-half the total number of cables installed at each

termination point. For example: A telecommunications outlet with four Category 6a cables installed would require two Category 6a equipment connection cords at the work area outlet and two Category 6a equipment connection cords in the telecommunications equipment room for a total of four Category 6a equipment connection cords. A telecommunications outlet with a 4-strand fiber optic cable installed would require one duplex fiber optic patch cord(s) at the work area outlet and one duplex fiber optic patch cord(s) in the telecommunications equipment room for a total of two duplex fiber optic patch cord(s). Provide equal amounts of each length indicated in Part 2, Products.

3.5 COORDINATION OF CONDITIONS

- A. Structured cabling for wireless access points of a given description may be used in more than one type of ceiling or wall structure. Coordinate ceiling construction, wall types, recessing depth and other construction details prior to ordering special components indicated in the details for shipment. Where materials supplied do not match ceiling construction replace them at no cost to Owner.

END OF SECTION

SECTION 283100
FIRE ALARM / EMERGENCY VOICE ALARM COMMUNICATION SYSTEM

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 DESCRIPTION:

- A. This section of the specifications includes the furnishing, installation, connection and programming of new microprocessor controlled, networked addressable reporting emergency voice alarm communication system fire alarm equipment to form a complete coordinated system ready for operation. It shall include, but not be limited to an emergency voice alarm communication system fire alarm panel, voice amplification power supplies, a voice alarm microphone, alarm initiating devices, alarm notification appliances, auxiliary monitoring and control devices.
- B. This Section includes the furnishing of all labor, equipment, materials, and performance of all operations associated with the installation of the Fire Alarm / Emergency Voice Alarm Communication System as required by the drawings and specified herein.

1.3 SCOPE:

- A. The Contractor shall furnish and install booster power 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.

1.4 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. 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.

1.5 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.

1.6 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).

1.7 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:

- A. This emergency voice alarm communication and fire alarm system design is based on the use of microprocessor-based addressable emergency voice alarm communication and fire alarm control equipment, initiation devices and notification appliances equipment manufactured by Edwards.

2.2 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

1. Attic Heat Detectors

- a. Attic Heat Detectors shall be the fixed high temperature (200-deg F) type approved for 50ft spacing.

C. Waterflow Switches (System Sensor WFD Series)

- 1. Waterflow switches shall be integral, mechanical, non-coded, non-accumulative retard type.
- 2. Waterflow switches shall have an alarm transmission delay time that is conveniently adjustable from 0 to 60 seconds.
- 3. Waterflow switches shall be located a minimum of one (1) foot from a fitting that changes the direction of the flow and a minimum of three (3) feet from a valve.
- 4. Each waterflow switch shall be individually monitored by an addressable monitor module that is connected to the initiation device circuit of the fire alarm system.

D. Sprinkler and Standpipe Valve Supervisory Switches:

- 1. Each sprinkler system water supply control valve riser or zone control valve, and each standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.
- 2. Each Post Indicator Valve (PIV) shall be equipped with a supervisory switch.
- 3. Mount switch so as not to interfere with the normal operation of the valve and adjust to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.
- 4. The mechanism shall be contained in a weatherproof aluminum housing, that shall provide a 3/4-inch tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.

5. Switch housing to be finished in red baked enamel.
6. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.
7. Each valve supervisory switch shall be individually monitored by an addressable monitor module that is connected to initiation device circuit of the fire alarm system.

2.3 ADDRESSABLE MODULES, CONTROL RELAYS, AND AUXILIARY DEVICES

A. Addressable Monitor Module

1. Addressable Monitor modules shall be provided to connect one supervised IDC (zone) of conventional Alarm Initiating Devices (any N.O. dry contact device) to the Fire Alarm Control Panel Signaling Line Circuit (SLC) Loop.
2. The monitor module shall be mounted in a 4-inch square, 2-1/8" deep electrical box.
3. The IDC (zone) may be wired for Style D (Class A) or Style B (Class B) operation. The Monitor module shall provide address-setting means using decimal switches and shall also store an internal identifying code that the Fire Alarm Control Panel shall use to identify the type of device. An LED shall be provided that shall flash under normal conditions, indicating that the Monitor module is operational and in regular communication with the control panel.

B. Addressable Control Module

1. Addressable Control Modules shall be provided to supervise and control the operation of one conventional Notification Appliance Circuit (NAC) of compatible, 24 VDC powered, polarized Audio/Visual appliances or audio speakers.
2. The Control Module shall be mounted in a standard 4-inch square, 2-1/8" deep electrical box.
3. The NAC shall wire in a Class B (Style Y) or Class A (Style Z) fashion. Each control module shall support up to 1 Amp of Inductive or 2 Amps of Resistive Audible/Visual signals.
4. Audible/Visual power shall be provided by a separate notification appliance circuit from the main Fire Alarm Control Panel or from a fire alarm expander panel.
5. The Control Module shall provide address-setting means using decimal switches and shall also store an internal identifying code that the Control Panel shall use to identify the type of device. An LED shall be provided that shall flash under normal conditions, indicating that the Control Module is operational and is in regular communication with the control panel.
6. A magnetic test switch shall be provided to test the module without opening or shorting its NAC circuit wiring.

C. Auxiliary Relays

1. Auxiliary relay coils shall be rated at 120V and contacts shall be rated for 120V, 20A, and shall conform to UL 864.
2. Auxiliary relays shall be listed with the California State Fire Marshal (CSFM).

2.4 NOTIFICATION APPLIANCES

A. Speakers

1. ADA/NFPA/ANSI compliant
2. Complies with OSHA 29 Part 1910.165
3. 24 VDC with wide UL "Regulated Voltage" using filtered DC or unfiltered VRMS input voltage
4. 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)
5. High efficiency design for maximum output at minimum wattage across a frequency range of 400 to 4000 HZ
6. Fast installation with IN/OUT screw terminals using #12 to #18 AWG wires
7. Optional Extender (E60 Ext) is for mounting to 4" backboxes with no extension ring.
8. 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. High efficiency design for maximum output at minimum wattage across a frequency range of 400 to 4000 HZ
8. Fast installation with IN/OUT screw terminals using #12 to #18 AWG wires
9. 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 NEC, NFPA 72, local and state codes, 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 $\frac{3}{4}$ ".
- 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. Provide a circuit breaker lock-on devices on each circuit breaker supplying fire alarm system equipment and provide a red label that reads: "FIRE ALARM / ECS" adjacent to the circuit breaker.
- E. Fire Alarm Booster Power Panel Primary Power wiring shall be 12 AWG.

- F. Where the new fire alarm control panel is tied to an existing fire alarm control panel, the Contractor shall provide, install and connect all wiring, addressable control relays and addressable monitor modules at both the new and existing control panels and program to allow each fire alarm panel to accept and respond to alarm, trouble and supervisory initiation signals from the other fire alarm control panel.

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.
- C. The Fire Alarm Panel cabinet shall be grounded with an equipment grounding conductor that is run with the primary power wiring. Cabinet doors shall be bonded to cabinets with braided grounding straps of sufficient length to allow the cabinet door to fully open.

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. Zone Programming:
 - 1. The Contractor shall provide zone programming for the Fire Alarm System as follows:
 - a. Each building shall be programmed as a separate zone.
 - b. Each floor of a multi-story building shall be programmed as a separate zone.
 - c. Each section of a floor in a building that is separated by area separation walls or by horizontal exits shall be programmed as a separate zone.
 - d. Additional zones shall be programmed where deemed necessary by the authority having jurisdiction.
 - 2. Zone programming for the Fire Alarm System shall match the zone map (refer to Article titled, IDENTIFICATION AND DOCUMENTATION, for zone map requirements.)

C. LCD Annunciation

1. The Contractor shall program the LCD annunciator at the Fire Alarm Control Panel and remote LCD annunciators to annunciate the following information:
 - a. The zone that is in alarm.
 - b. The type of alarm initiating device:
 - 1) Smoke Detector.
 - 2) Other.
 - c. The location of the device that is in alarm (refer to Article titled, IDENTIFICATION AND DOCUMENTATION, for device map location requirements.)

D. Controls

1. The Contractor shall utilize addressable control relays and auxiliary relays and shall program the fire alarm system control panel to cause the closure of fire/smoke dampers and provide a signal for HVAC units to shut down.

E. Remote Monitoring Station

1. The 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.
2. Where the new fire alarm control panel is tied to an existing fire alarm control panel, the Contractor shall program the existing fire alarm panel to accept and respond to alarm and trouble initiation signals from the new fire alarm control panel.

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. Documentation Cabinet – Provide and install a documentation cabinet marked "FIRE ALARM SYSTEM RECORD DOCUMENTS" located adjacent to each fire alarm control unit.

- D. Provide a red label at each branch circuit breaker that supplies power to the Fire Alarm Control Panel and Fire Alarm Booster Power Panels that reads: "FIRE ALARM / ECS".
- E. Provide a label on the inside of the cabinet door of each fire alarm cabinet that is supplied by a branch circuit that identifies the panel, circuit number and location of the power panel that is supplying that fire alarm cabinet.

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 310513
SOILS FOR EARTHWORK

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.
- B. Related Sections:
 - 1. Division 31 Section "Site Clearing."
 - 2. Division 31 Section "Trenching."
 - 3. Division 31 Section "Earthwork."
 - 4. Appendix, Geotechnical Recommendations.

1.3 SUBMITTALS

- A. Samples: Submit, in air-tight containers, 10 lb. sample of Type S3 and S4 fill to inspector.
- B. Materials Source: Submit location of imported materials source. Provide materials from same source throughout the work. Change of source requires approval.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Soil Types:
 - 1. Soil Type S1: Excavated and reused material, graded, free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
 - 2. 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.
 - 3. Soil Type S3: Imported topsoil, friable loam; reasonably free of roots, rocks larger than 1/2 inch, debris, weeds, and foreign matter.

4. Soil Type S4: Imported borrow, suitable for purposes intended, free of vegetable matter and other unsatisfactory material, meeting the following characteristics:
 - a. Maximum Particle Size (inches): 3 inches.
 - b. Percentage Passing 76mm Sieve (3 inch): 100%
 - c. Percentage Passing #4 Sieve: 65-100%.
 - d. Percentage Passing #200 Sieve: 20-45%.
 - e. Plasticity Index: < 12
 - f. Expansion Index: < 20
 - g. Corrosion Potential:
 - 1) Soluble Sulfates: < 1,500 mg/kg
 - 2) Soluble Chlorides: < 300 mg/kg
 - 3) Soil Resistivity: > 3,000 ohm-cm
5. 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 shall be performed by field representative of Owner's Geotechnical Engineer.

PART 3 - EXECUTION

3.1 STOCKPILING

- A. Stockpile imported material on site at location designated by project inspector.
- B. Stockpile 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 freestanding surface water.

END OF SECTION

SECTION 311000 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. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above and below-grade site improvements.
6. Disconnecting, capping or sealing, and removing site utilities.

B. Related Sections:

1. Division 01 Section "Construction Waste Management Disposal" for management of waste materials.
2. Division 02 Section "Selective Site Demolition" for removal partial removal of buildings or structures.
3. Division 31 Section "Earthwork."
4. Appendix; Geotechnical Recommendations.

1.3 REFERENCES

- A. Geotechnical Recommendations for earthwork requirements. Additional addendums and reports may exist, contractor shall obtain all documents prior to construction.

1.4 DEFINITIONS

- A. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.

- D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.
 - 1. Tree protection shall be defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated
- E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.5 MATERIALS OWNERSHIP

- A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 SUBMITTALS

- A. Existing Conditions: Digital photographic documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
- B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.7 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site.

1.8 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises at location directed by Architect.

- D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- E. Do not commence site clearing operations until temporary erosion and sedimentation control and plant-protection measures are in place.
- F. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.
- I. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Comply with requirements of referenced Geotechnical Recommendations for site clearing operations.
- B. Protect and maintain benchmarks and survey control points from disturbance during construction.
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.
- D. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Identify trees to remain by wrapping a 1-inch blue vinyl tie tape flag around each tree trunk at 54 inches above the ground.
- E. Protect trees, plant growth, and vegetation not specifically designated for removal.
- F. Verify that existing plant life to be removed has been authorized for removal.

- G. Examine site and compare individual work areas with the Drawings and Specifications.
- H. Thoroughly investigate and verify conditions under which the work is to be performed.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Comply with Storm Water Pollution Prevention Plan (SWPPP) and requirements of authorities having jurisdiction.
- B. Provide temporary erosion and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- C. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- D. Inspect, maintain, and repair erosion and sedimentation-control measures during construction until permanent vegetation has been established.
- E. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 EXISTING UTILITIES

- A. Utilities to Remain: Locate, identify, and protect utilities that are to remain from damage.
- B. Interrupting Existing Utilities: 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:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
- C. Utility Termination: Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place. Arrange with utility companies to shut off affected utilities and notify Owner not less than 48 hours in advance of utility termination.
 - 1. Excavate for and remove underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

- A. Clear only limited areas required for execution of work at proposed improvement location.
- B. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 2. Grind down stumps and remove roots, obstructions, and debris to a depth of not less than 24 inches below the bottom of the lowest structure footing or 2 feet below finished subgrade whichever depth is lower. Root systems deeper than indicated above shall be excavated to allow no roots larger than 0.5 inches in diameter.
 3. Use only hand methods for grubbing within protection zones.
 4. Chip removed tree branches and dispose of off-site.
- C. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density of minimum 90 percent of maximum density.

3.5 TOPSOIL EXCAVATION

- A. Remove sod, grass, and similar vegetation before stripping topsoil.
- B. Strip topsoil to depth indicated in the geotechnical recommendation in a manner to prevent intermingling with underlying subsoil or other waste materials.
1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
1. Limit height of topsoil stockpiles to 72 inches.
 2. Do not stockpile topsoil within protection zones.
 3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.

3.6 SITE IMPROVEMENTS

- A. Remove existing above and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated. Remove paving only where authorized and necessary to execute the Work.
1. Neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 2. Remove concrete slabs, paving, walks, gutters, and curbs to nearest joint locations.

3. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION

SECTION 312000 EARTHWORK

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. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
2. Over excavation of building pad and pavement area.
3. Excavating soil and other material for surface improvements.
4. Placing fill.
5. Compaction of existing ground and fill.
6. Preparation of subgrade for other improvements.
7. Grading of soil.

- B. Related Sections:

1. Division 31 Section "Site Clearing."
2. Division 31 Section "Trenching."
3. Appendix, Geotechnical Recommendations.

1.3 REFERENCES

- A. ASTM D 1557.
- B. Geotechnical Recommendations for earthwork requirements. Additional addendums and reports may exist, contractor shall obtain all documents prior to construction.

1.4 DEFINITIONS

- A. Fill: Soil material or controlled low-strength material used to fill an excavation or raise existing grades.
- B. Borrow Soil: Satisfactory soil imported from off-site for use as fill.
- C. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

- D. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- E. Subgrade: Uppermost surface of an excavation.
- F. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 SUBMITTALS

- A. Material Test Reports: Classification according to ASTM D 2487 for each borrow soil material proposed for fill and backfill.

1.6 QUALITY ASSURANCE

- A. Preexcavation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

- A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.
- B. Do not commence earth moving operations until temporary erosion and sedimentation control measures required by authorities having jurisdiction are in place.
- C. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- D. Do not commence earth moving operations until protection measures are in place.
- E. Delete the following paragraph and related subparagraphs if not required, if retained, edit for project conditions.
- F. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
 - 1. Any borrow soil materials proposed to be brought on-site are subject to inspection and testing by Owner's geotechnical testing agency to verify they are in compliance with referenced standards. Owner shall determine if testing of materials is required prior to any material being brought onto the site. Testing of materials may take up to two weeks to verify compliance with standards.
- B. Soil Types:
 - 1. Refer to Section 310513 "Soils for Earthwork".
- C. Soil for Fills:
 - 1. Fill in Turf or Planting Areas: Excavated soils that have been graded and cleansed of excessive organics, debris, rocks, and lumps.
 - 2. Fill in Turf or Other Planting Areas: Type S2 or S3.
 - 3. Fill in Non-planting Areas: Type S1, S2 or S4. A geotechnical testing agency shall verify that the existing soils are suitable for fill operations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly examine the project site prior to submitting his bid to familiarize himself with the conditions of the site and the conditions in which he will be required to work.
- B. Contractor shall thoroughly examine contract documents prior to bid.
 - 1. Documents do not necessarily indicate a balanced site.
 - 2. Contractor shall be responsible for importing materials from an off-site location or exporting excess material to an off-site location.

3.2 PREPARATION

- A. Site clearing specified in Division 31 Section "Site Clearing" shall be performed prior to beginning earthwork.
- B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations. Coordinate excavations near existing utilities with utility companies.
- C. Protect and maintain erosion and sedimentation controls during earth moving operations.
- D. Identify required lines, levels, contours and datum.
- E. Locate, identify, and protect existing above and below grade utilities from damage.
- F. Protect plant life, lawns, trees, shrubs, and other features not authorized for removal.
- G. Employ equipment and methods appropriate to the work site.
- H. Protect excavated areas from drainage inflow and provide drainage to all excavated areas.
- I. Follow the over-excavation requirements as indicated on the geotechnical recommendations.

3.3 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.4 STORAGE OF SOIL MATERIALS

- A. Stockpile excavated satisfactory soil and materials borrow soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust. Stockpile soil materials away from edge of excavations. Do not store within drip line of trees to remain.

3.5 EXCAVATION

- A. Earthwork shall comply with requirements and recommendations in referenced Geotechnical recommendations.
 - 1. A representative from the Owner's geotechnical testing agency shall be present during earthwork operations.
- B. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
- C. Excavations at Edges of Tree and Plant-Protection Zones: Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots.
- D. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
- E. Where authorized to cut roots, cut roots with a saw.
- F. Review and coordinate the following paragraph requirements with the geotechnical recommendations.
- G. Excavation for Structures: Over excavation under proposed structures shall be performed per the Geotechnical recommendations and addendums.
- H. Review and coordinate the following paragraph requirements with the geotechnical recommendations.
- I. Excavation for Pavements and Flatwork: Over excavation under proposed pavements and flatwork shall be performed per the Geotechnical recommendations.

3.6 SUBGRADE INSPECTION

- A. If representative of Owner's geotechnical testing agency determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- B. Proof-roll subgrade below building slabs, pavements, and walks with equipment of type, size, and weight recommended by representative of Owner's geotechnical testing agency to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 - 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

3.7 FILLING AND COMPACTING

- A. Coordinate this article with requirements in the geotechnical recommendations.
- B. After excavation and just prior to filling, the bottom of excavations shall be scarified to a depth of 8 inches, moisture conditioned to near optimum moisture content, and compacted to a minimum of 90 percent of maximum density based on ASTM Method D 1557. Concrete and pavement subgrade surfaces should be compacted to 95 percent relative compaction.
- C. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to at or above optimum moisture content.
- D. Coordinate the following with requirements in the geotechnical recommendations.
- E. Fills shall be placed in lifts less than 8 inches in loose thickness, moisture conditioned to within 2 percent of optimum moisture content, and compacted to values indicated.
- F. Place soil fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- G. Compact soil materials to not less than the following percentages of maximum dry unit weight according ASTM D 1557:
 - 1. Coordinate the following with requirements in the geotechnical recommendations.
 - 2. Upper 12 inches under pavements: 95 percent.
 - 3. Under structures, building slabs, steps, and walkways: 95 percent.
 - 4. Under turf or unpaved areas: 90 percent.

3.8 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated on Drawings.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1/2 inch.
 - 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.9 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. Delete highlighted text in the following paragraphs for non-DSA projects.
 - 2. 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 of test specimens on the project site.
 - 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 in accordance with the 2022 California Building Code, Section 1705A.6 and Table 1705A.6, DSA Testing and Inspections form DSA 103, and Structural Drawings Special Inspection Criteria.
- E. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- F. Compaction testing will be performed in accordance with ASTM D 1557 (Method A).
- G. If tests indicate work does not meet specified requirements, recompact, or remove and replace, and retest.

3.10 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.11 CLEANING AND DISPOSAL OF SURPLUS MATERIALS

- A. Rake Clean.
- B. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.
- C. Adjacent roadways shall be kept clean during the progress of this work.

END OF SECTION

SECTION 312005
TRENCHING

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. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Sections:

- 1. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
- 2. Division 21, 22, 23, 26, 27, 28, and 33 Sections as applicable for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.
- 3. Division 31 Section "Soils for Earthwork" and "Earthwork" for soil types and earth moving.

1.3 DEFINITIONS

- A. Utility: Any buried or above ground piping, conduit, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:

- 1. Warning tapes.

1.5 PROJECT CONDITIONS

- A. Existing Utilities: A diligent attempt has been made to indicate on the Drawings the locations of utilities which may affect the Work. Utility locations are based on information provided by the Owner and limited above grade site observation. The locations of indicated utilities shall be considered approximate only until exposed by the Contractor.
 - 1. Maintain existing utilities in constant service during construction of the Work.
 - 2. Utility Locator Service: Notify utility locator service for area where Project is located before beginning trenching operations.
- B. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during trenching operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- C. Do not commence trenching operations until temporary erosion and sedimentation control measures are in place.
- D. Do not commence earth moving operations until plant and landscape protection measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations. The acceptance of borrowed soil materials shall be subject to review and approval by the architect.
- B. Satisfactory Soils:
 - 1. Refer to Section 310513 "Soils for Earthwork".
 - 2. Refer to City/County Standards.
- C. Sand: ASTM C 33; fine aggregate.

2.2 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility.

1. Detectable Warning Tape: Provided detectable warning tape for underground utilities that would otherwise not be detectable by above ground utility locating methods. Detectable warning tape shall include metallic core encased in a protective jacket for corrosion protection and be detectable by a metal detector when tape is buried up to 30 inches deep.
2. Colors: Warning tape shall be colored as follows:
 - a. Red: Electric.
 - b. Yellow: Gas.
 - c. Orange: Telephone and other communications.
 - d. Blue: Water systems.
 - e. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Comply with requirements of referenced Geotechnical Report for site trenching and backfilling operations.
- B. Comply with the Trench Excavation and Backfill Requirements
- C. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by trenching operations.
- D. Locate, identify, and mark existing underground utilities.
- E. Protect plant life, lawns, trees, shrubs, and other features not authorized for removal.
- F. Protect and maintain erosion and sedimentation controls during trenching operations.
- G. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- H. 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.
- I. Prevent surface water and ground water from entering excavations and from flooding Project site and surrounding area. Protect excavations from softening and damage by rain or water accumulation.
 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.2 EXCAVATION FOR UTILITY TRENCHES

- A. Provide protection for all open excavations, backfill trenches on same day in which excavation occurs to avoid leaving excavations open overnight.
- B. Excavate trenches to lines, depths, and widths required for installation of utilities.
- C. Cut trenches just wide enough to enable installation of utilities and proper backfill, and to allow inspection.
- D. 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.
- E. Use hand excavation methods to locate and expose 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 on the ground by utility locating service or Owner.
- F. When excavating through tree roots, perform work by hand and cut roots, where authorized, with a saw.
- G. Excavate trenches to provide not less than the minimum cover required.
- H. Do not interfere with 45 degree bearing splay of foundations.
- I. Hand trim excavations for bell and spigot pipe joints. Remove loose matter.
- J. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- K. 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 satisfactory soil material, thoroughly compacted. No additional payment will be made for such over-excavation and refill.
- L. In trenches where a firm foundation is not encountered, such as soft, spongy, or otherwise unsuitable material, remove the material to a minimum of 12 inches below the bottom of the proposed pipe or structure, or to a depth determined by the Geotechnical Engineer, and backfill the space with satisfactory soil material containing sufficient moisture to produce maximum compaction. No additional payment will be made for such additional excavation or backfill.
- M. Stockpile excavated material to be returned to trench adjacent to trench in location which will not be detrimental to existing improvements, trees, or pedestrian or vehicular traffic. Cover to prevent windblown dust. Remove unsuitable or excess material not being used, from site.

- N. In areas of sandy soils, shoring and sloping back the trench sidewalls may be required.

3.3 BACKFILL FOR UTILITY TRENCHES

- A. Prior to placing backfill in excavations, complete the following:
 - 1. Survey locations of underground utilities for Record Documents.
 - 2. Test and inspect underground utilities.
 - 3. Remove trash and debris.
 - 4. Remove temporary shoring and bracing.
- B. Backfilling and Compaction: Carefully place and compact backfill of satisfactory soil materials as follows:
 - 1. Install bedding per pipe manufacturer recommendations, County Standards, and Geotechnical Report recommendations.
 - 2. Initial Backfill: Place initial backfill of satisfactory soil free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit. Carefully compact initial backfill to 90% maximum density evenly on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit.
 - 3. Subsequent Backfill: Place backfill of satisfactory soil material in layers not more than 8 inches in loose depth and carefully compact.
 - 4. Final Backfill: Place final backfill in thickness required, but not more than 8 inches, to achieve final subgrade elevation after compaction and as required for grading.
 - 5. Compaction: Compact soil using hand operated tampers or lightweight power operated tamping equipment that will not damage or displace installed utilities. Compact each layer of backfill to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 - a. Review and coordinate compaction requirements with the project geotechnical report and with the Division 31 "Earthwork" Section.
 - b. Turf or Unpaved Areas: 90%.
 - c. Areas Under Paving: 95%.
- C. Trenches under Roadways: Provide 4-inch thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."
- D. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

- E. Soil Moisture Control: Uniformly moisten or aerate soil materials before compaction to at least two (2) percent above optimum moisture content.
 - 1. Do not over moisten or flood trenches to move or settle soil materials.
 - 2. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 3. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.
- F. Grading: Uniformly grade areas to be smooth and flush with adjacent grade free of irregular or abrupt surface changes. Provide final grading in turf or landscaped areas where no further grading will occur.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- B. Allow testing agency to inspect and test each fill or backfill layer. Proceed with subsequent Work only after test results for previously completed work comply with requirements.
- C. Testing agency will test compaction of soils in place according to ASTM D 1557. Tests will be performed at the following locations and frequencies:
 - 1. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.
- D. When testing agency reports that backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.5 PROTECTION

- A. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

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. 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 each type of termite control product from 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.

1.5 PREINSTALLATION MEETINGS

- A. 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.

1.6 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.

1.7 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: Fiveyears 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 TERMITICIDE

- A. Termiticide: EPA-registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.

- 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. 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.
3. 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. Treat soil materials of conditions indicated below before under slab vapor barriers, concrete footings and slabs are placed.
 - 1. Slabs-on-Grade: Apply termiticide to soil under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment.
 - 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 footings; and 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 by exposure to water spillage or weather until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

END OF SECTION

SECTION 32 12 16
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.
- B. SSCDOT – Standard Specifications, State of California, Department of Transportation (Caltrans) latest edition, except references to method of payment, and references to any state furnished materials.

1.2 SUMMARY

- A. Section Includes:
 - 1. Hot-mix asphalt patching.
 - 2. Hot-mix asphalt paving.
- B. Related Sections:
 - 1. Division 31 Section "Earthwork."

1.3 DEFINITION

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
 - 1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
 - 2. Job-Mix Designs: For each job mix proposed for the Work.
- B. Material Certificates: For each paving material, from manufacturer.
- C. Material Test Reports: For each paving material.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the California Department of Transportation.
- B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Section 39 of the Caltrans Specifications.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
- C. All improvements within property owned by a City, County, or State Entity shall be in accordance with the Standards and Specifications of the authority having jurisdiction.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
 - 1. Prime Coat: Minimum surface temperature of 50 deg F.
 - 2. Tack Coat: Minimum surface temperature of 50 deg F.
 - 3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
 - 4. Asphalt Base Course: Minimum surface temperature of 50 deg F and rising at time of placement.
 - 5. Asphalt Surface Course: Minimum surface temperature of 50 deg F at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. Aggregates: The grading and proportioning of aggregates shall be such that the combined mineral aggregate conforms to the specified requirements. All aggregates shall be clean and free from decomposed materials, organic materials, and other deleterious substances.
 - 1. Aggregates for base course shall conform to Section 26 of the State Standard Specifications, Class 2 for 3/8 inch maximum size gradation.
 - 2. Aggregates for asphaltic concrete shall conform to Type A as outlined in Section 39 of the State Standard Specifications. Aggregate grading shall be 3/4 inch maximum, coarse for 1-1/2 inches or greater in total new pavement thickness.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: PG 64-10 in accordance with Section 92 of the Caltrans Specifications.
- B. Asphalt Cement: ASTM D 946 for penetration-graded material.
- C. Prime Coat: Asphalt emulsion prime coat complying with Section 94 of the Caltrans Specifications. Prime coat is not required unless specifically noted on the Drawings.
- D. Tack Coat: Asphaltic emulsion for use as tack coat shall be of the penetration type conforming to the requirements of Section 94 of the Caltrans Specifications.
- E. Water: Potable.

2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.
- B. Sand: ASTM D 1073, Grade Nos. 2 or 3.
- C. Joint Sealant: ASTM D 6690, Type I, hot-applied, single-component, polymer-modified bituminous sealant.

2.4 MIXES

- A. Hot-Mix Asphalt: Asphalt concrete shall be Type A and shall conform to the provisions of Section 39 of the Caltrans Specifications. The asphalt binder shall be steam refined paving asphalt classified as PG 64-10 in accordance with Section 92 of the Caltrans Specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Geotechnical Engineer shall verify that subgrade is stable and in suitable condition to begin paving.
- B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Subgrade preparation shall be as specified in Division 31 Section "Earthwork."

- B. Prior to construction of base course and asphaltic concrete, clean previously constructed subgrade or subbase of all foreign substances. The surfaces shall be inspected for the specified compaction and trueness to line and grade.
- C. Base Course: Aggregate base shall be placed in accordance with requirements of Section 26 of the State Standard Specifications and to the thickness shown. The materials shall be graded and compacted in maximum 4-inch layers to at least 95 percent of maximum density (ASTM D 1557).
 - 1. The base course shall be maintained until the asphaltic pavement is in place. Maintenance shall include drainage, rolling, shaping, and watering as necessary to maintain the course in proper condition. Sufficient moisture shall be maintained at the surface to prevent a dusty condition by light sprinkling with water. Areas of completed base course that are damaged by freezing shall be conditioned, reshaped and recompactd in accordance with the requirements of this specification, without additional cost to the Owner.
- D. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared base course is ready to receive paving.
- E. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
- F. Prime Coat: Prime Coat is only required if indicated on Drawings. It shall be the Contractor's option to apply Prime Coat if not indicated on the Drawings. Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.
 - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 - 2. Protect primed substrate from damage until ready to receive paving.
- G. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd. Tack coat will not be required over surfaces of existing pavement unless indicated on the Drawings. Where indicated it shall be applied uniformly to existing pavement surfaces at a rate of 0.05 to 0.15 gal./sq. yd.
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.3 HOT-MIX ASPHALT SPREADING, LAYING, AND COMPACTING

- A. Spreading and laying operations shall conform to the requirements of Sections 39-5 and 39-6 of the Caltrans Specifications. Where the total depth of paving exceeds 0.20 feet, the top layer of asphalt concrete shall not exceed 0.20 feet in compacted thickness. The aggregate for this layer and all lower layers shall be 3/4" maximum aggregate (medium). The next lower layer shall not exceed 0.25 feet in compacted thickness. Any lower layers shall not exceed 0.25 feet in compacted thickness. For total asphalt concrete thickness of 3 inches or greater, the minimum layer thicknesses shall be 1.5 inches compacted. Total asphalt concrete thicknesses of 3 inches may be placed in one layer at Contractor's option. No asphalt concrete paving shall be placed when the atmospheric temperature is below 50 degrees Fahrenheit. Compaction operations shall conform to the requirements of Section 39-6.03 of the Caltrans Specifications.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
 - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.
- D. All utility boxes and/or manholes shall be set flush with finished grade after placing final lift of asphalt paving, unless noted otherwise.

3.4 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus 1/2 inch.
 - 2. Surface Course: Plus 1/2 inch, no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
 - 1. Base Course: 1/4 inch.
 - 2. Revise subparagraph above or first subparagraph below to suit Project.
 - 3. Surface Course: 1/4 inch.
 - 4. Retain subparagraph below if crowned pavement surfaces are required.
 - 5. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.5 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd.
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- C. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.6 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
 - 1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.
 - 1. Clean cracks and joints in existing hot-mix asphalt pavement.
 - 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
 - 3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner shall engage a qualified testing agency to perform tests and inspections. Agency shall be qualified according to ASTM D 3666 for testing indicated.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements. Additional construction, testing, and replacement costs resulting from damaged or improperly installed infrastructure shall be paid for by the Contractor.

3.8 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow milled materials to accumulate on-site.

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING AND WALKS

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. SSCDOT – Standard Specifications, State of California, Department of Transportation (Caltrans) latest edition, except references to method of payment, and references to any state furnished materials.

1.2 SUMMARY

- A. Section Includes: Concrete paving for the following:
 - 1. Walks and pedestrian paving.
- B. Related Sections:
 - 1. Division 03 Section "Cast-in-Place Concrete" for general building applications of concrete.
 - 2. Division 31 Section "Earthwork."

1.3 DEFINITIONS

- A. Cementitious Materials: Type II gray Portland Cement conforming to the specifications of ASTM C150-02a and the requirements of Caltrans Specification Section 90 for "Type II Modified" portland cement.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Material Test Reports: For each of the following:
 - 1. Aggregates. Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
- D. Delivery Tags: Delivery tags for all concrete.

1.5 QUALITY ASSURANCE

- A. All improvements within property owned by a City, County, or State Entity shall be in accordance with the Standards and Specifications of the authority having jurisdiction.
- B. 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.
- C. 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.
- 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. 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 318-19, "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."

1.6 REGULATORY REQUIREMENTS FOR PEDESTRIAN PAVING

- A. Concrete paving for accessible pedestrian routes for persons with disabilities shall comply with the following per 2022 California Building Code (CBC) requirements:
 - 1. Changes in Level: 1/4 inch maximum vertical change in level; changes greater than 1/4 inch to not more than 1/2 inch shall be beveled with a slope not exceeding 1:2 vertical to horizontal; offsets exceeding 1/2 inch shall be by a ramp (CBC 11B-303).
 - 2. Cross Slope of Walks and Ramps: 1/4:12 maximum (CBC 11B-403.3).
 - 3. Slope of Pedestrian Pavements: 1/4:12 maximum in any direction where there is no defined direction of travel (CBC 11B-403.3).
 - 4. Slope of Door and Ramp Landings: 1/4:12 maximum in any direction (CBC 11B-404.2.4.4 and 11B-405.7.1). Changes in level are not permitted within door and ramp landings.
 - 5. Slope of Parking Stalls and Access Aisles for Persons with Disabilities: 1/4:12 maximum in any direction (CBC 11B-502.4). Changes in level are not permitted within accessible parking stalls and access aisles.

6. Slope of walks in the direction of travel: 1:20 (5%) maximum (CBC 11B-403.3).
7. Slope of Ramps in the Direction of Travel: 1:12 (8.33%) maximum (CBC 11B-405.2).
8. Width of Walks and Ramps: 48 inches minimum clear width (CBC 11B-403.5.1 and 11B-405.5).

PART 2 - PRODUCTS

2.1 FORMS MATERIALS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
 1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from steel wire into flat sheets.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- C. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.
- D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:
 1. Portland Cement: Type II gray Portland Cement conforming to the specifications of ASTM C150-02a and the requirements of Caltrans Specification Section 90 for "Type II Modified" Portland Cement.

- B. Normal-Weight Aggregates: ASTM C 33, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: Potable and complying with ASTM C 94/C 94M.

2.4 CURING MATERIALS

- A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- B. Water: Potable.
- C. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating. It shall be the Contractor's responsibility to verify that all curing compounds used comply with the VOC Emission requirements of the San Joaquin Valley Air Pollution Control District.

2.5 RELATED MATERIALS

- A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.

2.6 CONCRETE MIXTURES

- A. General: Concrete mixtures shall comply with requirements of authorities having jurisdiction.
- B. Mixtures for concrete pavements, gutters and curbs subject to vehicular traffic:
 - 1. Concrete shall be Class 2 (Previous years denoted as Class A) and shall contain 564 pounds minimum (6 sacks) of Portland Cement per cubic yard conforming to the requirements of Section 90 of the Caltrans Specifications.
 - a. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
 - 2. Proportion mixtures to provide normal-weight concrete with the following properties:
 - a. Compressive Strength (28 Days): 3000 psi minimum.
 - b. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
 - c. Slump Limit: 4 inches maximum.
- C. Mixtures for concrete walks, gutters and curbs subject to only pedestrian traffic:

1. Concrete shall be Class 3 (Previous years denoted as Class B) and shall contain 505 pounds minimum of Portland Cement per cubic yard conforming to the requirements of Section 90 of the Caltrans Specifications unless noted otherwise on the drawings.
 - a. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
 2. Proportion mixtures to provide normal-weight concrete with the following properties:
 - a. Compressive Strength (28 Days): 2500 psi minimum.
 - b. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.58.
 - c. Slump Limit: 5 inches maximum.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.
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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and base surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared base surface below concrete paving to identify soft pockets and areas of excess yielding.
1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
 2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Division 31 Section "Earth Moving."
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
 - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
 - 2. Provide tie bars at sides of paving strips where indicated.
 - 3. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys as shown on the Drawings.
 - 4. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

- C. Isolation Joints: Form isolation joints of preformed joint-filler strips where noted on the Drawings.
1. Extend joint fillers full width and depth of joint.
 2. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
 3. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 4. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 5. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Grooved Joints: Form 1/4-inch wide contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius unless noted otherwise on the drawings. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
 - a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.
 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 developing random contraction cracks.
 - a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius unless noted otherwise on the Drawings. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

- E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement and dowels.
- H. Screed paving surface with a straightedge and strike off.
- I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- J. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- K. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to 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 in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 CONCRETE FINISHING

- A. Float Finish: After initial floating during placement, begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
- 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.

3.8 CONCRETE PROTECTION 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 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. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these as follows:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.9 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:
 1. Elevation: 1/4 inch.
 2. Thickness: Plus 3/8 inch, no minus.
 3. Surface: Gap below 10-foot- long, unlevelled straightedge not to exceed 1/4 inch
 4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
 5. Lateral Alignment and Spacing of Dowels: 1 inch.
 6. Vertical Alignment of Dowels: 1/4 inch.
 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
 8. Joint Spacing: 3 inches.
 9. Contraction Joint Depth: Plus 1/4 inch, no minus.
 10. Joint Width for Grooved Joints: Plus 1/8 inch, no minus.
- B. Requirements for accessible pedestrian routes for persons with disabilities:
 1. Refer to regulatory requirements referenced in Part 1 Article "Regulatory Requirements for Pedestrian Paving" of this specification section.

3.10 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. 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 at least one composite sample for each 5000 sq. ft. or fraction thereof of each concrete mixture placed each day.
 - 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/C 231M, pressure method; 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 it is 80 deg F and above, and one test for each composite sample.
 - 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 - 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- E. Strength of each concrete mixture will be satisfactory if the 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.
- F. 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.

- G. 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.
- H. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, compressive strengths, or other requirements have not been met, as directed by Architect.
- I. Concrete will be considered defective if it does not pass tests and inspections.
- J. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- K. Test and inspection reports are to be prepared and distributed by the testing agency.

3.11 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Additional construction, testing, and replacement costs resulting from damaged or improperly installed infrastructure shall be paid for by the Contractor.
- C. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.
- D. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- E. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 32 13 73
CONCRETE PAVING 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. Cold-applied joint sealants.
 - 2. Joint-sealant backer materials.
 - 3. Primers.
- B. Related Requirements:
 - 1. Division 07 Section "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. 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.
- C. Paving-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.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of joint sealant and accessory.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

- B. Product Testing: Test joint sealants using a qualified testing agency.

1.6 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.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, 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.

2.2 COLD-APPLIED JOINT SEALANTS

- A. Single Component, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.
 - 1. Available Product: W.R. Meadows, Inc.; Pourthane SL.
 - a. Subject to compliance with requirements, provide product indicated or a comparable product subject to Architect's approval.
- B. Multicomponent, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade P, Class 25, for Use T.
 - 1. Available Product: Pecora Corporation; Urexpan NR-200 or DynaFlex.
 - a. Subject to compliance with requirements, provide product indicated or a comparable product subject to Architect's approval.
- C. Joint-Sealant Application: Joints within concrete paving.
 - 1. Joint Location:
 - a. Expansion and isolation joints in concrete paving.
 - b. Contraction joints in concrete paving.
 - c. Other joints as indicated.
- D. Joint-Sealant Color: As selected by Architect from Manufacturer's full range.

2.3 JOINT-SEALANT BACKER MATERIALS

- A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.
- B. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.
- C. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.4 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints 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: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. 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.

3.3 INSTALLATION OF JOINT SEALANTS

- A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.
- C. Install joint-sealant backings to support joint 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 joint-sealant backings.
 - 2. Do not stretch, twist, puncture, or tear joint-sealant backings.
 - 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:
 - 1. Place joint sealants so they fully contact 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.
- E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements 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 joint sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING AND PROTECTION

- A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.
- B. 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 and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

END OF SECTION

SECTION 32 17 00
PAVING SPECIALTIES

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. Pavement-marking.
- 2. Wheel stops.
- 3. Tactile warning surfaces.
- 4. Traffic and pedestrian signage.

- B. Related Sections:

- 1. Division 32 Sections as applicable to asphalt paving, concrete paving and concrete walks.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

- B. Shop Drawings: For the following:

- 1. Pavement Markings: Indicate pavement markings, colors, lane separations, parking spaces, directional arrows, and accessibility markings.
- 2. Tactile Warning Surfaces: Indicate locations and extent of tactile warning surfaces.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: The following shall comply with requirements of the ADA Standards for Accessible Design and the 2022 California Building Code, Chapter 11B.

- 1. Tactile warning surfaces.
- 2. Pavement markings for disabled access parking stalls and access aisles.
- 3. Signage for disabled access relating to parking stalls, parking lots, and accessible path of travel to building entrances including vertical clearance below post mounted signs located adjacent to walking surfaces.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

- A. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 PAVEMENT MARKING PAINT

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Dunn-Edwards Corporation.
 - 2. Ennis Traffic Safety Solutions.
 - 3. Frazee Paint, Comex Group.
 - 4. The Sherwin-Williams Company
- B. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with one of the following:
 - 1. FS TT-P-1952, Type II, with drying time of less than 45 minutes.
 - 2. MPI #97 Latex Traffic Marking Paint.
- C. Colors: Unless otherwise indicated, provide colors as follows:
 - 1. White:
 - a. Parking stall lines and text markings.
 - b. Figure and border of international symbol of accessibility (ISA) markings at accessible parking stalls.
 - c. Diagonal striping for accessible parking stall access aisles where marked on asphalt paving.
 - d. Traffic arrows.
 - 2. Blue: Color equal to Color 15090 per Federal Standard 595C.
 - a. Background of international symbol of accessibility (ISA) markings at accessible parking stalls.

- b. Perimeter of accessible parking stall access aisles.
 - c. Diagonal striping for accessible parking stall access aisles where marked on concrete paving.
- 3. Red: Curbs of fire lanes, face and top of curb.
- 4. Black: For painting out existing pavement markings.
 - a. Tint to match color of pavement.

2.2 TACTILE WARNING SURFACES

A. Basis of Design: Drawings and Specifications are based on the following:

- 1. ADA Solutions, Inc.
 - a. Replaceable Wet-Set detectable warning tile panels.
 - b. Surface Mount detectable warning tile panels.
- 2. Subject to compliance with requirements, provide product indicated or a comparable product subject to request for substitution.

B. Description: Homogeneous fiberglass and carbon reinforced composite panels with ADA compliant truncated dome pattern on exposed surfaces, panels are colorfast and UV stable with uniform color throughout the thickness of the panel.

- 1. Replaceable Wet-Set Detectable Warning Tile Panels: Tile panels designed for setting in freshly poured concrete and mechanically anchored with stainless steel fasteners.
- 2. Surface Mount Detectable Warning Tile Panels: Tile panels designed for surface application on existing concrete with mechanical and adhesive fastening.
- 3. Standard Sizes: 24 by 36, 48, and 60 inches; 36 by 36 and 60 inches.
- 4. Thickness:
 - a. Wet-Set Tiles: 1/4 inch nominal thickness with a 3/4 inch thick by 1 inch wide perimeter flange.
 - b. Surface Mount Tiles: 3/16 inch thick with 1/2 inch wide beveled edge at all edges.
- 5. Physical Characteristics:
 - a. Compressive Strength: 28,900 psi, ASTM D695.
 - b. Slip Resistance: 1.18 dry, 1.05 wet, ASTM C 1028.
 - c. Flame Spread Index: Less than 25, ASTM E 84.
 - d. Freeze/Thaw/Heat: No disintegration, ASTM C 1026.
- 6. Tactile Surface Domes (Regulatory Requirements per 2022 CBC 11B-705):
 - a. Dome Size:
 - 1) Base Diameter: 0.90 inches minimum, 0.92 inches maximum.
 - 2) Top Diameter: 0.45 inches minimum, 0.47 inches maximum.

3) Height: 0.2 inches.

- b. Dome Configuration and Spacing: Square grid, 2.3 inches minimum, 2.4 inches maximum, center to center spacing. Base edge to base edge spacing of 0.65 inch minimum measured to the most adjacent domes on a square grid.

7. Color: Yellow equal to Color 33538 per Federal Standard 595C.

C. Accessory Materials: Accessory materials shall be recommended in writing by the tactile surface panel manufacturer.

- 1. Fasteners for Wet-Set Tile: Manufacturer's standard stainless steel inserts and matching bolts, 1/2 inch diameter, factory attached to tile panels.
- 2. Fasteners for Surface Mounted Tile: Manufacturer's standard stainless steel sleeve anchors, 1/4 inch diameter.
- 3. Adhesive/Sealant for Surface Mounted Tile: Solvent free polyether adhesive/sealant, ASTM C 920, Type S, Grade NS, Class 25, Uses NT, T, M, G, A & O.

a. Acceptable Product: ChemLink, Inc.; M-1 Structural Adhesive/Sealant

2.3 WHEEL STOPS

- A. Wheel Stops: Precast, air-entrained concrete, 2,500-psi minimum compressive strength, 6 inches high by 6 inches wide by 48 inches long, and reinforced with (4) #3 reinforcing bars. Provide chamfered corners and holes for anchoring to substrate.
- B. Dowels: Galvanized steel, 1/2 inch diameter, 10-inch minimum length.

2.4 TRAFFIC AND PEDESTRIAN SIGNAGE

- A. Traffic Signs: Provide traffic signs as indicated on Drawings complying with the following requirements:
 - 1. Material: Aluminum sheet, ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 5005-H32, 0.080 inch minimum thickness.
 - 2. Corner Condition: Rounded to radius of 1-1/2 inches unless otherwise indicated.
 - 3. Finish: Manufacturer's standard powder coat or baked enamel reflectorized finish.
 - 4. Size: As indicated on Drawings.
 - 5. Color: As indicated on Drawings.
 - 6. Text and Graphics: As indicated on Drawings.
- B. Brackets: Extruded aluminum brackets and fittings to suit sign construction and mounting conditions for bracket-mounted signs.

- C. Fasteners: Non-corrosive fasteners compatible with sign and post materials; provide fasteners with vandal/theft resistant heads.
- D. Sign Posts: Galvanized steel pipe, ASTM A53, standard weight, Schedule 40, size as indicated on Drawings.
- E. Concrete for Sign Posts: Ready mixed concrete or prepackaged concrete mix for site mixing requiring only the addition of water at the project site; minimum 2000 psi compressive strength at 28 days.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions in which products are to be applied or installed with installer/applicator present.
- B. Proceed with only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING APPLICATION

- A. Preparation:
 - 1. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
 - 2. Allow paving to age for time period recommended by paint manufacturer, but not less than 30 days before starting pavement marking.
 - 3. Test concrete paving for alkalinity, pH level shall be less than the maximum value recommended by paint manufacturer.
 - 4. Sweep and clean surface to eliminate loose material and dust. Surfaces shall be clean, dry, and free of oil, grease, and other foreign matter.
- B. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
 - 1. Width of Lines: 4 inches unless otherwise indicated on Drawings.
 - 2. Graphics and Lettering: Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
- C. Prohibit traffic until traffic paint is fully dry.

3.3 WHEEL STOP INSTALLATION

- A. Accurately locate and align wheel stops as indicated on Drawings. Where wheel stops are installed parallel to curbs or paving edge, wheel stops shall be aligned in a straight line.
- B. Securely attach wheel stops to pavement with not less than two galvanized-steel dowels embedded at one-quarter to one-third points. Securely install dowels into pavement and bond to wheel stop. Recess head of dowels beneath top of wheel stop and grout holes.

3.4 TACTILE WARNING SURFACE INSTALLATION

- A. General: Install tactile warning surface tile panels in accordance with manufacturer's written installation instructions.
- B. Wet-Set Tile Panels: Accurately place tile panel in position in freshly finished concrete, tamp unit using a rubber mallet and a block of wood, continue tamping until all air has been released and the surface of the tile panel is flush with the surrounding concrete surface. Provide 1/8 inch space between adjacent panels of multiple panel installations.
 - 1. Concrete shall have a smooth trowel finish prior to placement of tile panel(s).
 - 2. After installation of tile panel, finish concrete around perimeter of panel with a 1/4 inch edge trowel.
 - 3. When no further panel adjustment is needed, apply weight to panel until the concrete is set. Protect panels from traffic until concrete is cured.
 - 4. Remove protective film from panel after concrete has cured.
- C. Surface Mounted Tile Panels: Install panels using adhesive and mechanical fasteners. Provide 1/8 inch space between adjacent panels of multiple panel installations.
 - 1. Clean existing concrete surface of debris, oil, and grease.
 - 2. Lay out panels and confirm fit and panel location.
 - 3. Apply adhesive as follows using care in applying adhesive so that excessive amounts of adhesive will not be squeezed out from underneath panels.
 - a. Panels for Curb Ramps: Apply a 3/8 inch bead of adhesive to the flat framework on the bottom of panels.
 - b. Panels for Other Locations: Apply full adhesive coverage to the bottom of the panel using a 3/16 by 3/16 inch or 1/4 by 1/4 inch square notch trowel.
 - 4. Drill concrete through preformed fastener locations in the panel and install fasteners. If additional fastener locations are required, drill and install fasteners in accordance with manufacturer's written instructions.
 - 5. Seal perimeter panel edges after anchoring panels. Remove protective films and clean panels of concrete dust from drilling prior to sealing perimeters of panels.

3.5 SIGNAGE INSTALLATION

A. Sign Post Installation:

1. Post Excavation and Footings: Drill or hand-excavate holes for posts to diameters and depths indicated in firm, undisturbed soil; if footing diameters and depths are not indicated on Drawings, footings shall be not less than 10 inches diameter by 30 inches deep; tops of footings shall be established as 4 inches below finish grade.
2. Post Setting: Verify that posts are set plumb, aligned, and at correct height; hold in position during setting with concrete or mechanical devices; the bottom of posts shall be 3 inches above the bottom of footings. Place concrete around posts and vibrate or tamp for consolidation. Protect above ground portion of posts from concrete splatter.
 - a. Posts in Paved Areas Installed Prior to Paving: Comply with the following:
 - 1) Posts in Concrete Paved Areas and Curbs: Coordinate top of paving elevation and pour concrete fill to approximately 6 inches below finish grade.
 - 2) Posts in Asphalt Concrete Paved areas: Concrete fill to be flush with adjacent paving and crowned to shed water away from posts. Coordinate top of paving elevation and form top 6 inches of footing with round concrete form of diameter matching post footing; pour concrete fill prior to paving operations.
 - b. Posts in Unpaved Areas: Concrete fill to be 2 inches above finish grade and crowned to shed water away from posts. Coordinate finish grade elevation and form top 6 inches of footing with round concrete form of diameter matching post footing.

B. Sign Installation: Attach signs to posts with appropriate brackets and theft resistant fasteners.

1. The bottom of signs shall be at least 80 inches above walking surfaces when located adjacent to pedestrian paths of travel.
2. Peen ends of exposed threads to prevent removal of fasteners.
3. Where signs are indicated to be fastened to buildings or fences, install as indicated on Drawings.

END OF SECTION

SECTION 323113
CHAIN LINK FENCES AND GATES

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. Chain-link fences and associated fence framing.
 - 2. Swinging service gates.

- B. Related Sections:

- 1. Division 08 Section "Door Hardware" for gate operating hardware for maintenance gates.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, gate hardware, and finishes for chain-link fences and gates.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show accessories, hardware, gate operation, and operational clearances.

1.4 FIELD CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 REGULATORY REQUIREMENTS

- A. Accessible Pedestrian Gates: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines, ICC/ANSI A117.1, and the accessibility requirements of Chapter 11B of the California Building Code.

2.2 MANUFACTURER: Subject to compliance with requirements, provide one of the following:

1. United States Steel Corp.
2. Anchor Fence, Inc.
3. Master-Halco Co

2.3 CHAIN-LINK FENCE FABRIC

- A. General: Provide chain link fence fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:
 1. Fabric Height: As indicated on Drawings.
 2. Wire diameter: 0.148 inches (9 gage).
 3. Mesh Size: 1 inch.
 4. Zinc-Coating: ASTM A 392, Type II, Class 1, 1.2 oz./sq. ft. with zinc coating applied after weaving.
 5. Selvage: Knuckled selvages top and bottom.

2.4 FENCE FRAMEWORK

- A. Posts and Rails: ASTM F 1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F1043 or ASTM F1083 based on the following:
 1. Fence Height: As indicated on Drawings.
 2. Heavy industrial strength round steel pipe, material Group IA, schedule 40, galvanized; pipe coated inside and outside by hot-dipped method, 1.8 oz. per square foot of outside and inside surfaces; provide members with minimum dimensions and wall thickness according to ASTM F 1083 based on the following:
 - a. Line Posts:
 - 1) Fence height under 6 feet: 1.9 inches outside diameter, 2.72 plf.
 - 2) Fence height 6 feet to 8 feet: 2.375 inches outside diameter, 3.65 plf.

- b. End, Corner and Pull Posts:
 - 1) Fence height under 6 feet: 2.375 inches outside diameter, 3.65 plf.
 - 2) Fence height 6 feet to 8 feet: 2.375 inches outside diameter, 3.65plf.
- c. Gate Posts: Posts for individual gate leaf widths as follows:
 - 1) Gate leaf width to 6 feet: 2.875 inches outside diameter, 4.85 plf.
 - 2) Gate leaf width over 6 feet to 12 feet: 4.00 inch outside diameter, 9.11 plf.
- d. Top Rail and Brace Rails: 1.66 inches outside diameter, 2.27 plf.
 - 1) Manufacturer's longest lengths, with expansion type couplings, approximately 6" long, for each joint.
 - 2) Post Brace Assembly: Manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use the same material as top rail brace, and truss to line posts with 0.375" diameter rod and adjustable tightener.

2.5 TENSION WIRE

- A. Tension Wire: 0.177-inch diameter, marcelled steel tension wire complying with ASTM A 817 and ASTM A 824; Type II, zinc coated (galvanized), Class 4, not less than 1.2 oz./sq. ft. of uncoated wire surface.

2.6 SWING GATES

- A. General: Comply with ASTM F 900 for gate posts and swing gate types.
 - 1. Gate Height: Match fence height.
 - 2. Gate Leaf Width: As indicated on Drawings.
 - a. Pedestrian gates shall provide not less than 32 inches in clear width with the gate in a 90-degree open position; gate leaf width shall not exceed 48 inches.
 - b. Service Gates: Width as indicated on Drawings.
 - c. Fire department vehicle access gates shall provide not less than 20 feet in clear width with the gates in a 90-degree open position.
- B. Gate Framing: Steel pipe matching fence framing and as follows:
 - 1. Gate leaf width up to 6 feet: Perimeter and intermediate framing of 1.90 inches outside diameter, 2.72 plf.
 - 2. Gate leaf width over 6 feet to 12 feet: Perimeter framing of 2.375 inches outside diameter, 3.65 plf., and intermediate framing and bracing of 1.90 inches outside diameter, 2.72 plf.

C. Gate Construction:

1. Joints and Connections: Weld all joints and connections.
2. Bracing: Provide adjustable truss rod bracing for all gates and between intermediate framing members for gate leaves over 8 feet in width.
3. Intermediate Framing: Provide intermediate vertical framing for gates exceeding 8 feet in width; equally space intermediate framing and space not more than 8 feet on center; weld connections.
4. Diagonal Cross Bracing: Install diagonal cross bracing consisting of 3/8" diameter adjustable length truss rods on gated to ensure frame rigidity without sag or twist.
5. Kick Plates for Maintenance and Accessible Pedestrian Gates: Provide 1/8 inch thick by 10-inch-high galvanized steel plates at the bottom of each side of gates to provide a smooth and unobstructed surface for persons in a wheel chair. Kick plates shall be without sharp edges or corners. Plates shall not interfere with the ability to adjust truss rod bracing.

D. Gate Hardware at Maintenance Gates:

1. Hinges: Non-lift-off type, 180-degree swing in direction indicated on Drawings. Provide 1-1/2" pair of hinges for each leaf over 6 feet nominal in height.
2. Latches - Single Gates 3'-0" wide to 4'-0" Wide: Lockset with lever handles. Coordinate with the District's Locksmith department.
 - a. Operating hardware for gates is specified in Division 08 Section "Door Hardware."
3. Latches – Single Gates wider than 4'-0" wide: Forked type or plunger bar type to permit operation from either side of gate, with padlock eye as an integral part of the latch.
 - a. Padlock and Chain: Schlage KS 47-743 Brass Padlock with Schlage Composite Keyway to accept district standard gate key for site. Chain to be welded to gate frame and padlock.
4. Double Gates: Provide gates stops for double gates, of pipe sleeve, set in concrete, and designed to engage drop bolt. Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with a single padlock.
5. Gate Stops: Provide gates stops for each leaf of paired gates.
6. Gate Keepers: Provide gate keepers for each gate leaf 5 feet or more in width, which automatically engages gate leaf and holds it in open position until manually released.

2.7 FITTINGS

- A. Fittings, General: Comply with ASTM F 626.
- B. Post Caps: Caps shall be weatherproof to prevent moisture intrusion into posts. Provide line post caps with loop to receive top rail; provide post cap for each post.
- C. Rail and Brace Ends: Designed to provide secure connection of top rails to terminal post and brace or other rails to terminal and intermediate posts; provide for each gate, corner, pull, and end post.
- D. Rail Fittings: Provide the following:
 - 1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
 - 2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate rails in the fence line-to-line posts.
- E. Stretcher Bar Brace Bands: Space not over 15 inches on center, to secure stretcher bars to end, corner pull, and gate post.
- F. Stretcher Bars: One-piece lengths equal to full height of fabric, with minimum cross-section of 3/16" x 3.4". Provide one stretcher bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into post.
- G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment; 3/8 inch minimum rod diameter.
- H. Tie-Wire: Standard round wire ties for attaching chain-link fabric to posts, rails, and frames; hot-dip galvanized steel, 0.148-inch (9 gage) diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.
- I. Hog Rings: Round wire ties for attaching chain-link fabric to bottom tension wire; 0.12-inch diameter of same material and finish as fabric wire.
- J. Finish: Metallic coating for pressed steel or cast iron fittings, not less than 1.2 oz. /sq. ft. zinc.

2.8 SETTING MATERIALS

- A. Cementitious Material: Portland cement, ASTM C 150, Type II, gray.
- B. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information. Proportion normal-weight concrete mixture as indicated below for strength, slump, water/cement ratio, and maximum aggregate size.
 - 1. Strength: 3000 psi at 28 days.

2. Aggregate Size: 1-1/2 inch maximum.
3. Slump: 4 inches.
4. Water Cement Ratio: 0.53 Maximum.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
 1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 200 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

- A. Install chain-link fencing according to ASTM F 567 and more stringent requirements specified.
 1. Install fencing at locations indicated on Drawings; for fencing located at property lines, install fencing inside property line.

3.4 FENCE FRAMING INSTALLATION

- A. Post Excavation and Footings: Drill or hand-excavate holes for posts to diameters, depths, and spacings indicated on Drawings in firm undisturbed soil.
 1. If footing diameters and depths are not indicated on Drawings, footings shall be as follows:
 - a. Tops of footings shall be established as 4 inches below finish grade.
 - b. Fences to 6 Feet in Height:
 - 1) Line Posts: 12 inches diameter by 48 inches deep.
 - 2) End, Corner, and Pull Posts: 12" inches diameter by 48 inches deep.
 - 3) Gate Posts, Gate leaf to 6 Feet Wide: 18" inches diameter by 54 inches deep.

- 4) Gate Posts, Gate leaf over 6 Feet to 12 Feet Wide: 24 inches diameter by 54 inches deep.

B. Post Setting: Set posts with concrete footings at indicated spacing.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Comply with the following for posts in paved areas installed prior to paving:
 - 1) Posts in Concrete Paved Areas, Curbs, and Mow Strips: Coordinate top of paving elevation and pour concrete fill to approximately 6 inches below finish grade.
 - 2) Posts in Asphalt Concrete Paved areas: Concrete fill to be flush with adjacent paving and crowned to shed water away from posts. Coordinate top of paving elevation and form top 6 inches of footing with round concrete form of diameter matching post footing; pour concrete fill prior to paving operations.
 - b. Posts in Unpaved Areas: Concrete fill to be 2 inches above finish grade and crowned to shed water away from posts. Coordinate finish grade elevation and form top 6 inches of footing with round concrete form of diameter matching post footing.

C. Terminal Posts: Install terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.

D. Line Posts: Space line posts uniformly at 10 feet o.c. unless otherwise indicated.

E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at midheight of fabric on fences with top rail. Install so posts are plumb when diagonal rod is under proper tension.

F. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

G. Intermediate and Bottom Rails: Where indicated or required, install and secure to posts with fittings.

- H. Bottom Tension Wire: Install according to ASTM F 567 extended along and within 6 inches of bottom of fabric maintaining plumb position and alignment of fencing. Pull wire taut, without sags; install tension wire before stretching fabric; tie to each post with not less than same diameter and type of wire.

3.5 CHAIN-LINK FABRIC INSTALLATION

- A. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave approximately 2 inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- B. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches o.c.
 - 1. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.
- C. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing. Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.
- D. Fasten fabric to bottom tension wire with 0.120 inch diameter hog rings spaced a maximum of 24 inches o.c.

3.6 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.7 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 328400
LANDSCAPE IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all materials, labor, equipment and services necessary to furnish and install Landscape Irrigation System, accessories and other related items necessary to complete the Project as indicated by the Contract Documents unless specifically excluded. The extent of the underground landscape irrigation system is shown on the drawings. The Contractor shall carefully review the plans and specifications and if they feel that more equipment is needed, they shall include that in the bid. All extra work to achieve full coverage shall be at the Contractors expense. Sprinkler systems shall be complete, operative and automatic and provide full coverage of the planted areas.
- B. Irrigation systems shall be constructed to the sizes, grades and locations shown on the plans. Irrigation pipelines shown on the plans are essentially diagrammatic. Locations of all irrigation improvements shall be established by the Contractor at the time of construction. Typical spacing of the sprinklers are shown on the plans and shall not be exceeded, except by written permission of the Owner's authorized representative.
- C. The system has been designed to a pressure as indicated in these specifications. The Contractor shall test the mainline prior to starting any work and verify that such pressure does exist. If it does not, the Contractor shall notify the Owner at once for a ruling before starting work. If the Contractor does not test prior to starting work, all corrective work shall be at the Contractors expense.

1.2 RELATED SPECIFICATION SECTIONS

Division 31	EARTHWORK
32 9000	LANDSCAPE CONSTRUCTION
Division 03	CONCRETE
Division 26	ELECTRICAL

1.3 STANDARDS

- A. Materials and installation shall conform to all State and Local codes and regulations governing the trades included in this work. Requirements of these plans and specifications not conforming therewith, but exceeding code requirements, then the plans and specifications shall govern.

1.4 EXPLANATION AND EXAMINATION OF SPECIFICATIONS AND PLANS

- A. Due to the scale of the Drawings, it is not possible to indicate offsets, fittings, etc. which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of their work and plan their 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 irrigation systems, planting, utilities, and architectural features will be avoided.
- B. Notes on Drawings: Work called for on the Drawings by notes shall be furnished and installed whether or not specifically mentioned in the Specifications.
- C. It shall be the responsibility of the Contractor to carefully examine the site, plans and specifications relating to this work for completeness, accuracy and clarity. Any conflict, error, or clarification shall be immediately brought to the attention of the Owner's authorized representative in writing to obtain a ruling. Failure to do so prior to bidding shall result in any corrective work necessary shall be completed at the Contractor's expense.

SECTION 328400
LANDSCAPE IRRIGATION SYSTEM

- D. It is the intent of these specifications and plans to form a guide to accomplish the work of installing a complete sprinkler system which will operate in an efficient and satisfactory manner according to the workmanlike standards established for the irrigation industry. Therefore, any items not specifically noted, but necessary for a complete installation, shall be furnished and installed under this contract.
- E. Manufacturer printed instructions shall also be a part of these specifications and shall prevail over these specifications. The Contractor shall be responsible to provide such details and instructions to the inspecting person for approval or rulings.
- F. All general and specific notes shown on the drawings and details herein shall take precedence over these specifications. All work designated on the drawings by notes shall be furnished and installed.

1.5 PERMITS AND INSPECTIONS

- A. The Contractor shall obtain and pay required fees to any governmental or public agency. Permits for the installation or construction of the work included under this Contract, which are required by legally constituted authorities having jurisdiction, shall be obtained and paid for by the Contractor, each at the proper time. The Contractor shall also arrange for and pay costs in connection with inspections and examination required by these authorities.

1.6 GUARANTEE

- A. Irrigation system shall be guaranteed for a period of one year from the date of final acceptance. Any repairs required are to be completed by the Contractor in a timely manner at no additional cost to the Owner.

1.7 OPERATIONS AND MAINTENANCE INSTRUCTIONS / RECORD DOCUMENTS

- A. Two copies of equipment operations, maintenance instructions, and wire diagrams shall be furnished to the Owner prior to final acceptance. Two copies of control valve station charts (color coded reduced Irrigation Plan with plastic waterproof lamination) showing watering zones and stationing shall be provided and mounted in the controller pedestal.
- B. The Contractor shall furnish one set of reproducible Record Documents (As-Built drawings) in form of 24 lb bright white bond paper.
 - 1. Label first page of each document, or set of documents, "RECORD DRAWINGS" in neat large printed letters on lower right hand corner. Record information concurrently with construction progress. Do not conceal any work until required information is recorded on a daily basis.
 - 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 invert 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, by Addenda, or by Change Order.
 - d. Details not on original Contract Drawings.
 - 3. Deliver all Record Documents (As-Built) to Landscape Architect. Accompany submittal with transmittal letter in duplicate, containing:
 - a. Date.

SECTION 328400
LANDSCAPE IRRIGATION SYSTEM

- 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.

1.8 SUBMITTALS

- A. Within the required time period stated in the General Provisions, the Contractor shall submit six (6) copies of complete lists of proposed materials to Landscape Architect including manufacturer's name and catalog numbers.
- B. Shop drawings shall follow (six copies) for equipment including dimensions, capacities, and other characteristics listed in product specifications. Materials and equipment shall not be ordered until given written approval by Landscape Architect.

1.9 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. CEC California Electrical Code
 - 5. UL Underwriter's Laboratories

1.10 UNDERGROUND OBSTRUCTION

- A. The Contractor shall verify all underground obstructions, and / or utilities, existing or proposed, prior to trenching. Contractor shall avail themselves of any "as built" drawings of the site, Underground Service Alert (USA) 1-800-227-2600 and records of existing and proposed site work. This shall also include verifying between proposed irrigation work and existing / proposed underground utilities. Contractor shall call for a ruling by the Owner's Authorized Representative prior to work to obtain a ruling in the event of a conflict.
- B. The Contractor, after availing themselves to the existing record drawings, Underground Service Alert and coordination with other trades installing underground utilities and excavation operations incurs and damages any existing utility not identified, the Contractor shall stop work and notify the inspector on site, obtain a ruling and repair the damage.

1.11 WORKMANSHIP

- A. The Contractor shall have experience and demonstrated ability in the installation of irrigation systems of this type. No work shall be completed without supervision. All work shall be installed by skilled persons proficient in the trades required, in a neat, orderly and organized manner, with the recognized standards of craftsmanship developed for the industry and as described in the plans, specifications and manufacturers installation instructions.

SECTION 328400
LANDSCAPE IRRIGATION SYSTEM

1.12 PROTECTION TO THE PUBLIC HEALTH AND WELFARE

- A. The Contractor in the course of their work shall make every effort to guard the public health, safety and welfare during construction. This shall include erection of barricades, night warning lights and all necessary devices required to protect the public health and welfare or as required by existing governmental codes. The Contractor shall accept any and all liabilities arising from accident or injury on the job and after construction. All equipment which protrudes above grade shall be installed against a structure or an appropriate barricade shall be erected to protect public safety.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All materials and equipment to be used shall be as outlined on the irrigation legend, or as described in the irrigation notes and irrigation specifications. All materials shall be new and unused.
- B. All specified materials, products and manufacturers are relevant to describe the required quality and features of a particular component of the irrigation system, however, the specific product or manufacturer noted is to be construed to be followed by the words, "or approved equal".

2.2 PIPELINES / SLEEVES

- A. Irrigation Piping:
1. 2" thru 3": Pressure pipe / upstream of control valve (mainline pipe): PVC Schedule 40 solvent weld pipe, PVC Material ASTM D1784, Cell Class 12454B, Pipe Design ASTM D1785 & compliance with all NSF & IAPMO (UPC) requirements.
 2. 4" thru 6": Pressure pipe / upstream of control valve (mainline pipe): PVC Class 200 gasketed pipe, pressure rating 200 psi, SDR 21, PVC Material ASTM D1784, Cell Class 12454B, Pipe Design ASTM D2241 & Gasket Material ASTM F477.
 3. 1" thru 2 1/2": Circuit pipe / downstream of control valve (lateral pipe): PVC Class 200 solvent weld pipe, pressure rating 200 psi, SDR 21, PVC Material ASTM D1784, Cell Class 12454B & Pipe Design – SDR Pipe ASTM D2241.
 4. 2" and larger: Sleeving under hardscape / paving: 2" thru 3" PVC Schedule 40 solvent weld pipe, pressure rating varies, PVC Material ASTM D1784, Cell Class 12454B & Pipe Design ASTM D1785. 4" and larger PVC Class 200 gasketed pipe, pressure rating 200 psi, SDR 21, PVC Material ASTM D1784, Cell Class 12454B, Pipe Design ASTM D2241 & Gasket Material ASTM F477.
 5. Pipe shall be continuously and permanently marked with the following information: Manufacturer's name or trademark, nominal pipe size, schedule and type of pipe, pressure rating in PSI and (NSF, IAPMO & AWWA) seals of approval.
- B. Plastic pipe shall be as called for on the plan and extruded from PVC 1120/1220 and shall meet commercial standards CS 256-63. Class and schedule of pipe shall be as called for in the plans. Strict conformance with the manufacturers recommended installation instructions is required. Painted galvanized steel (schedule 40), threaded bronze nipples, copper or painted ductile iron pipe is to be used for any pipe installed above grade. Fittings for above grade piping are to be consistent with pipeline material. Sun burned pipe or pipe that has been abused in shipping and handling is not to be used.

SECTION 328400
LANDSCAPE IRRIGATION SYSTEM

- C. The Contractor is to install concrete thrust blocks as outlined in the thrust block detail and as recommended by the pipe & fitting manufacturers to secure all changes in direction or dead ends of all mainline pipe. The Contractor is to use rebar as needed if necessary to insure the stability of the pipe. Where concrete thrust blocks cannot be installed against continuous native subgrade, the Contractor is to install ductile iron mechanical joint restraints. No bending, or curving of pipe will be allowed, except as permitted by the pipe manufacturer. Pipe manufacturer must be approved prior to ordering materials.
- D. Where piping on the plans is shown under paved areas, but is running parallel and adjacent to planted areas, the intent of the plans is to install the piping in the planted area. PVC Class 200 sleeves are to be used with all pipe and wire installed under hardscaped surfaces over six feet (6'-0") wide or wider.
- E. Where pipeline routing changes occur in the field, the Contractor is to size the pipe so that a flow velocity of 4.0 feet per second is NOT exceeded. The minimum pipe size is 1", 3/4" and 1 1/4" pipe is not used due to its limited flow range. The following is a basic guide for sizing lateral pipes in the field:
1. 3/4" Pipe – Not Used
 2. 1" Pipe - 0 gpm thru 12.0 gpm
 3. 1 1/2" Pipe - 12.1 gpm thru 36.0 gpm
 4. 2" Pipe - 36.1 gpm thru 55.0 gpm

2.3 PIPELINE FITTINGS

- A. Fittings:
1. For PVC solvent weld plastic pipe, 2" thru 3" mainline fittings: PVC Schedule 80 socket fittings (ASTM A2564, D2466, D2464 & D2467), Type 1, Grade 1. All mainline fittings are to be PVC Schedule 80 type with solvent weld or threaded connections. Where male threads are required, use PVC schedule 80 TOE nipple in lieu of a male adaptor.
 2. For PVC mainline pipe, 4" mainline fittings: Ductile iron mechanical joint fittings with joint restraints as manufactured by MegaLug, LEEMCO, or approved equal. See manufacturer's instructions and recommendations. No angular deflection of mainline pipe at the fitting bell end is allowed. For automatic valve connections to large mainline (4" thru 6") pipe, Romac 202N ductile iron service saddle with double stainless steel straps may be used.
 3. For PVC solvent weld plastic pipe, 1" thru 2 1/2" lateral fittings: PVC Schedule 40 socket fittings (ASTM A2564, D2466, D2464 & D2467), Type 1, Grade 1. All lateral fittings (downstream remote control valve) not specifically noted as PVC Schedule 80 type in the specifications or irrigation details are to be PVC schedule 40 type with solvent weld or threaded connections.
 4. For connections between main lines and remote control valves: Schedule 80 PVC fittings and nipples (threaded both ends) or TOE nipples, see Irrigation Details.
 5. When connection is plastic to metal, Schedule 80 TOE nipple shall be used.
 6. Teflon tape shall be used on all small diameter (1/2" to 3") threaded connections. No liquid or paste pipe thread sealants are allowed.

SECTION 328400
LANDSCAPE IRRIGATION SYSTEM

- B. Risers to irrigation heads: Shall be as noted on Irrigation Details.
- C. Solvent Weld Adhesive: Weld-On cement & primer appropriate for size & type of pipe and fittings. See manufacturer's instructions and recommendations. Note weather and temperature limitations for use. Use primer for all joints, mainline and lateral pipe connections.

2.4 VALVES / CONTROL WIRE

- A. Automatic Control Valves: Globe / Angle valves operated by low-power solenoid, normally closed, with manual flow adjustment. Sizes and types as shown on drawings. Low voltage electrical connections to valves shall have a minimum 24" coiled loop to each valve in valve box, see details. Valves shall be installed in a heavy duty plastic valve box with bolt down lid. Install one valve per valve box, no exceptions.
- B. Control Wire: Single strand Copper, UL approved for direct burial, minimum size #14-1 (hot wires) & #14-1 (common wires) rated for 600 volts as manufactured by Paige Electric, or approved equal. Common wire to be white/green, control wire to be red/yellow, spare hot to be black, spare common to be blue. All low voltage valve wiring is to be installed adjacent to pipe and taped into bundles at ten (10'-0") foot intervals. Wiring is to be neatly organized and loosely laid in trench and not stretched or pulled tight with expansion coils (30") at all changes in direction. All low voltage "hot" wiring is to be continuous, between the valve location and the irrigation controller. Low voltage wire shall be color coded by controller. Contractor is to install a minimum of one spare hot wire and one spare common wire per controller looped to all remote control valves. Spare wires are to be color coded per controller.
- C. Control Wire Connectors: Valve to decoder wire connectors to be 3M DBY / DBR Direct Bury splice kits are to be used for all wire connections and spare wire ends. All splices are to be located in a valve box and no direct bury splices are allowed.
- D. Control Wire Marking: T. Christy Enterprise, Inc. Waterproof Irrigation I.D. Tag or approved equal (714) 771-4172.
- E. Control Valve Boxes: Christy heavy duty plastic valve boxes with heavy duty bolt down lids, or approved equal. See Irrigation Details for model numbers and sizes.
- F. Control Valve Box Marking: Heat imprinted or engraved with appropriate controller and station number.

2.5 IRRIGATION HEADS

- A. Spray Head: Molded plastic body with plastic nozzles. Refer to schedule on drawings. Manufacturer's numbers are listed with description.
- B. Rotor Head: Molded plastic and stainless steel construction. Gear driven with lockable arc adjustment and matched precipitation rate nozzles. Refer to schedule on drawings. Manufacturer's numbers are listed with description.
- C. Irrigation heads adjacent to concrete walks, mow strips or other paved areas shall be offset 3" to permit edging without damage to irrigation equipment. Irrigation heads are to be set at grade. Irrigation heads are to be adjusted so that no spray hits buildings, fences, walls, or hardscaped surfaces. Install anti-drain check valves under all irrigation heads that weep or show drainage after operation.

SECTION 328400
LANDSCAPE IRRIGATION SYSTEM

2.6 GATE VALVES

- A. 1" thru 3" Size, if required: Class 125 bronze gate valve, 200 psi WOG, manufactured domestically made of cast bronze material and cross handle with non rising stem as manufactured by NIBCO, or approved equal. Solid wedge with screw in bonnet gate valve with threaded connections resistant to dezincification.
- B. 4" thru 6" Size, if required: Resilient seat ductile iron gasketed joint gate valve rated for a minimum of 200 psi, manufactured domestically by NIBCO, Waterous or approved equal.

2.7 QUICK COUPLER VALVES

- A. Two piece valve with heavy duty brass construction with vinyl cover and single lug operation. Contractor is to supply Owner with three (3) quick coupler keys and three (3) hose swivels. See Irrigation Legend and Details for detailed descriptions.

2.8 CENTRAL CONTROL SYSTEM

- A. Rainbird Cloud based central control system is to be set up as part of the project. Contractor is responsible for all data collection, data input, programming for a complete and operational system using active weather control using online Et weather data.

2.9 HAND HELD RADIO SYSTEM

- A. Provide one (1) hand held maintenance radio kit (Rainmaster #PRO MAX-UA) with charger and carrying case and two universal ribbon cables to the District capable of remote activation of the irrigation system for maintenance purposes up to 24 stations.

2.10 FIELD SATELLITE CONTROLLER

- A. Field satellite controller shall be as specified on the plans. Pedestal mount shall have a concrete base. The installation shall be in accordance with the manufacturers instructions and recommendations. All electrical connections to the controller shall be the responsibility of the Contractor and shall be UL approved and meet all applicable codes and regulations. All wiring from the electrical source to controller shall be installed in UL approved electrical conduit.

2.11 IRRIGATION BOOSTER PUMP STATION

- A. Irrigation booster pump station is existing and is to remain and protect.

2.12 VALVE BOXES

- A. All valves, manual or automatic shall have a valve box, set flush with grade. All valve boxes shall be of heavy duty plastic construction with heavy duty bolt down lids. Valve boxes are to be manufactured by Applied Engineering, or approved equal. Maximum of one (1) valve per valve box, no exceptions. Placement of the valves within the valve boxes shall allow for proper servicing and maintenance space, or the installation will be rejected.

2.13 AIR RELIEF VALVES

- A. Air relief valves are not required for this project.

SECTION 32 8400
LANDSCAPE IRRIGATION SYSTEM

2.14 BACKFLOW PREVENTION DEVICES

- A. The backflow prevention device shall be as called for on the Plans and shall be acceptable to all applicable codes and regulations. Installation is to be by the Landscape Contractor. Contractor is to coordinate all work in the field with other trades.

2.15 OTHER MATERIALS

- A. Materials not specifically indicated but necessary for proper execution of this work shall be of the first quality as selected by the Contractor subject to the acceptance of Architect.
- B. All materials appearing in the legend and details of the irrigation drawings are part of this job. Contractor is responsible for installation according to drawings and details. The system shall efficiently and uniformly irrigate all areas and perform as required by these plans and specifications.

PART 3 - EXECUTION

3.1 IRRIGATION SYSTEM DESIGN

- A. Irrigation system is designed for a water pressure of 65 psi at the irrigation point of connection.
- B. Verify the design pressure provided at the irrigation point of connection prior to system modifications and report any discrepancies in writing to the Architect. Failure to inform the Architect of any discrepancy in design pressure seven working days prior to installation of the irrigation system shall institute the responsibility of corrective action to the Contractor, at no expense to the Owner.

3.2 IRRIGATION STAKING

- A. The location of all sprinklers, valves, piping and other irrigation improvements shall be staked out by the Contractor. All staking and measurements shall be taken from permanent objects, buildings, or other permanent hardscape features including survey bench markers, and are NOT to be taken from non-permanent boundaries such as turf boundaries which are subject to modification. All measurements shall be made in feet and inches, rounding to the nearest inch. All variations from the plans are to be continuously updated on a daily basis on the record (as built) drawings. The Contractor is to present the areas staked to the Landscape Architect for review and approval prior to starting work. The Contractor is to make the adjustments in staking requested by the Landscape Architect at no additional cost to the Owner.
- B. In planter areas, the Contractor is to stake the tree and shrub locations prior to layout of the irrigation system to get approval from the Landscape Architect in the field prior to trenching. Contractor is to use color coded flags to stake plant materials by variety. Landscape Architect may move plants, delete or add plants during the staking review process. Contractor is to make changes in the field and on the as built plans at no additional cost to the Owner. After the plant layout has been staked, reviewed, adjusted and approved, the Contractor is to stake the bubbler locations for each plant or tree. Bubblers are to be located within the plant water basin on the uphill side of the plant or tree. Bubblers that are too far from the plant or tree will need to be relocated within an acceptable difference. The plant or tree rootball is to have direct access to irrigation water from the intended bubbler. Sloppy or non-compliant work will be rejected.

3.3 EXCAVATION, BACKFILL

- A. Trenches for irrigation pipelines and sleeves shall be excavated either by hand or machine and shall be of sufficient width to permit proper handling and installation of the pipe and fittings.

SECTION 328400
LANDSCAPE IRRIGATION SYSTEM

The backfill shall be compacted and evened off with the adjacent soil level. Select fill material or sand shall be used if soil conditions are rocky, or have debris. No material over 3/8" shall be allowed near the pipe, 6" below it, or 6" above the pipe. Backfill shall be made early in the morning when the soil and pipe temperatures are the same. Pipe to be installed with a minimum cover of 18" for mainline pipe and 12" for lateral pipe with spray heads and 18" for lateral pipe with rotors. Backfill shall be in 6" (lifts) increments. Each (lift) increment shall be compacted as needed to prevent settlement with tamping machine. Backfill material is to be brought to the optimum moisture content prior to starting compaction operations.

- B. Contractor shall compact trench fill material as required to prevent settling of trenches. Contractor is to guarantee trenches against settling for a period of one year from the date of final acceptance by the Owner. Contractor is to fill, compact and seed settled trenches during this time at no additional cost to the Owner.
- C. All pipe in the same trench shall have a minimum clearance of 4" from each other. Pipelines are not to be stacked vertically in the same trench. Pipes and wires or conduit are to have a minimum clearance of 12" from each other. Final fill over trenches shall be compacted to a level grade with no depressions.

3.4 ROAD, DRIVEWAY, PARKING LOT AND SIDEWALK PIPELINE CROSSINGS

- A. Any pipe, wire or communication cable that crosses any hardscaped surface six feet (6'-0") or wider, shall be installed in a PVC class 200 sleeve that is a minimum of two times larger than the pipe or wire bundle being sleeved. Sleeves are to have a minimum trench cover of 18" deep. Pipelines and wires that are to be installed below existing hardscaped improvements are to be installed in a sleeve as noted above, by horizontal directional boring. No cutting and patching of any hardscaped surface will be permitted without written permission of the Owner's authorized representative. Newly paved areas are to be protected and preserved from construction damage. Jacking and hydraulic (water jet) driving are not permitted. The minimum sleeve size is two (2") inch. The Contractor is to verify the inside and outside diameters of pipes and wire bundles being sleeved to insure proper fit and installation. Irrigation pipelines and wires are to be installed in separate sleeves. No more than one (1) irrigation pipeline is allowed per pipe sleeve. Low voltage wires may be bundled with communication cable and installed in an appropriate size wire sleeve in conformance with NEC requirements for wires installed in conduit.
- B. If approval to cut and patch a hardscaped surface has been obtained, the Contractor shall make cuts by a pavement / concrete saw or other approved means. Where any cutting or breaking of hardscaped surface work is necessary, it shall be removed and replaced by the Contractor conforming to all prevailing project specifications and requirements. Cuts are to be made along existing scoring lines or other markings to minimize negative visual aesthetics. Barriers and night lighting shall be erected to protect the public health welfare and safety. If approval to cut and patch a hardscaped surface is denied, the Contractor shall make the crossing by using horizontal directional boring. All materials and labor for all sleeves and crossings, whatever method, are to be supplied by the Contractor at no additional cost to the Owner.
- C. Backfill shall be compacted to 95%. The Owner reserves the right to test such backfill. If the backfill does not meet the required 95% compaction, the Contractor shall recompact the trench. The Contractor shall pay for all additional testing until the work meets the specifications.

3.5 PIPING INSTALLATION

- A. General: Support piping without strain on joints or fittings and allow for piping expansion and contraction. "Snake" pipe into trench in accordance with manufacturer's recommendations to allow for expansion. Lay on solid sub-base, uniformly sloped.

SECTION 328400
LANDSCAPE IRRIGATION SYSTEM

- B. The Contractor shall examine all other portions of working drawing and plan trenching and pipe routing and depth so that no conflicts will arise between irrigation and any other work. Any corrective action will be the Contractor's responsibility at no further expense to the Owner. Contractor is to endeavor to route mainline pipes a minimum of fifteen feet (15'-0") from trees and is to get permission to install mainline pipe closer in tight locations from the Owners Authorized Representative.
- C. Joints:
1. PVC Solvent Weld: Pipe shall be cut square and reamed to full size. Check for assembly prior to solvent weld. Remove excess solvent. All assembly shall be in accordance with manufacturer's recommendations, including use of primer on 3/4" pipe or larger.
 2. Steel or PVC Schedule 40 Threaded: Pipe shall be cut square and reamed to full size. Threads shall be full cut, true and tapered. Teflon tape suitable for conveyed fluid shall be applied to male thread only.
 3. Open Ends: Open ends of piping shall be capped during progress to preclude foreign matter. All pipe shall be assembled free from dirt and pipe scale.
- D. The Contractor shall thoroughly flush all mainline and lateral piping prior to the installation of irrigation heads. Flush entire piping system of all debris.

3.6 IRRIGATION HEAD INSTALLATION

- A. Head spacing on drawings is diagrammatic. Head spacing and patterns shall be adjusted to provide complete and adequate coverage without overspray on non-planted areas. Flush all lines prior to installation of the sprinkler heads.

3.7 CONTROL WIRE

- A. Protect wire by running along side mainline piping, maintain 4" separation to mainline. Bundle wires together and tape at intervals of ten (10') feet. Do not tape wire together when encased in sleeve. Minimum cover shall be 18 inches. Connect wires together at valve manifold with 3M DBY / DBR splice kits as required. Tag all control wire splices with approved control wire marker at splices in valve box and in controller.

3.8 CONTROL VALVE BOX MARKING

- A. Imprint valve box lid by heat imprinting or engraving with appropriate controller and station number.

3.9 TESTING

- A. General: Unless otherwise directed, tests shall be witnessed by a representative of the Owner. Mainlines are to be center loaded with the joints exposed. Should any joints be covered before such tests, the Contractor shall, at their expense, uncover, test, and repair the 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. Piping Upstream of control valves (Mainline): Maintain 100 PSI 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. Perform test with control valves installed.

SECTION 328400
LANDSCAPE IRRIGATION SYSTEM

3.10 CONSTRUCTION OBSERVATION

A. Observation of Work:

1. Installation and operations must be approved by the Landscape Architect.
2. In no event shall the Contractor cover up or otherwise remove from view any work under this contract without prior approval of the Landscape Architect. Any work covered prior to inspection shall be opened to view by the Contractor at their expense.

B. Construction Observation: Periodic site visits shall be required for basic operations and installations during progression of the project. Such site visits will include, but not necessarily be limited to, the following items:

1. Preconstruction meeting.
2. Staking of plant and tree locations prior to irrigation installation.
3. Staking of sprinklers and mainline routing.
4. Mainline, wiring, lateral pipes & valve manifolds prior to backfill.
5. Irrigation coverage test and rough grading.
6. Trees & plants prior to installation, still in containers.
7. Fine grading of turf areas prior to sodding.
8. Substantial completion to start maintenance.
9. Final acceptance after successful maintenance period.

The Owner will pay for initial construction observation visits, however, any additional visits required due to non-compliance, incomplete work, or substandard performance will be paid by the contractor at a cost of \$900.00 per extra visit.

C. Coverage Test: When the irrigation system is completed, the Contractor in the presence of the Landscape Architect shall perform a coverage test of water afforded in the planting areas. The Contractor shall furnish all materials and labor required to correct any inadequacies of coverage disclosed. The Contractor shall inform the Landscape Architect of any deviation from the plan required due to wind, planting, soil, or site conditions that bear on proper coverage. If such corrections or additions are required in the irrigation system, the Contractor shall make all adjustments and corrections without any extra cost to the Owner.

D. Completion of Work: Prior to substantial completion and the start of the maintenance period, the Contractor shall deliver to the Owner a complete set of as built drawings on 24 lbs bright white bond paper, two (2) sets of manuals covering all materials in the irrigation system with a list of local vendors, two (2) sets of all tools required to maintain system in tool boxes, one (1) hand held remote radio kit, three (3) quick coupler keys with hose swivels and three (3) quick coupler cover keys, waterproof color coded controller diagrams and extra equipment listed below not installed as part of the project. Irrigation system shall be fully automatic, operable and provide full coverage of the planting areas. 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, due to developed conditions, to occupy any portion of the work before the Contract is fully completed, such occupancy shall not constitute

SECTION 328400
LANDSCAPE IRRIGATION SYSTEM

acceptance. The Contractor will not be responsible for any damage caused by the Owner's work forces.

3.11 EXTRA IRRIGATION EQUIPMENT

- A. The Contractor shall supply the following extra equipment to be installed at the direction of the Landscape Architect during the project. Each item is to include all piping, wiring, fittings, appurtenances, labor and equipment costs for a complete installation at no additional cost to the Owner. Should any items not be installed as part of the project, the remaining items are to be delivered to Owner as part of project completion documentation.

1. Five (5): Six inch pop up MP rotator sprinklers.
2. Five (5): Rainbird 5000+ rotors.
3. Five (5): Rainbird 6504 Falcon rotors.
4. One (1): 1" electric valve with line size filter.
5. One (1): 2" electric valve.
6. One (1): Quick coupler valve.

All work is to be in compliance with all project specifications and construction details at no additional cost to the Owner. Items not installed as part of the project are to be delivered to the Owner as part of project close out procedures (turn over items).

3.12 MAINTENANCE

- A. Adjustments: Irrigation system shall be maintained and adjusted as required to provide proper coverage throughout the 120 day maintenance period. Irrigation system maintenance shall commence upon approval of substantial completion following irrigation installation, planting operations, and general site clean up. Maintenance shall be continued until final acceptance.
- B. Irrigation controller shall be set during this time with Owner. Training for persons appointed by the Owner is to be completed during this time. Final acceptance of the project will NOT occur until all training of Owner's personnel is completed.

-- END OF SECTION --

SECTION 329000
LANDSCAPE CONSTRUCTION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all material, labor, equipment and services necessary to do all Landscape Construction work and other related items necessary to complete the Project as indicated by the Contract Documents unless specifically excluded. Work is to include, but is not limited to, the following:
1. Soil Testing
 2. Clearing, Ripping and Grading
 3. Cultivation, Soil Amending and Leaching
 4. Furnish and Plant Plants and Trees
 5. Fertilization
 6. Turfgrass Sod Installation
 7. Weeding
 8. Staking
 9. Clean-up and Maintenance

1.2 RELATED SPECIFICATION SECTIONS

Division 31	EARTHWORK
32 8400	LANDSCAPE IRRIGATION
Division 03	CONCRETE
Division 26	ELECTRICAL

1.3 STANDARDS

- A. Materials and installation shall conform with all State and Local codes and regulations governing the trades included in this work. Requirements of these plans and specifications not conforming therewith, but exceeding code requirements, then the plans and specifications shall govern.

1.4 DEFINITIONS

- A. The term approved shall mean by the Architect, and only in writing.

1.5 EXAMINATION OF SPECIFICATIONS, PLANS AND SITE

- A. It shall be the responsibility of the Contractor to carefully examine the site, plans and specifications relating to this work for completeness, accuracy and clarity. Any conflict, error, or clarification shall be immediately brought to the attention of the Owner's authorized representative in writing to obtain a ruling. Failure to do so prior to bidding shall result in any corrective work necessary shall be completed at the Contractor's expense.

1.6 PERMITS AND INSPECTIONS

- A. The Contractor shall obtain and pay required fees to any governmental or public agency. Permits for the installation or construction or the work included under this Contract, which are required by

SECTION 329000
LANDSCAPE CONSTRUCTION

legally constituted authorities having jurisdiction, shall be obtained and paid for by the Contractor, each at the proper time. Contractor shall also arrange for and pay costs in connection with inspections and examination required by these authorities.

1.7 GUARANTEE

- A. Guarantee shrubs, ground covers, and lawn as to growth and health for one (1) year after final acceptance by Owner. The contractor is responsible for replacement of plant materials due to theft and vandalism until final acceptance of the project by the Owner after completion of the specified maintenance period.
- B. Guarantee trees to live and grow upright for a period of one (1) year after completion and final acceptance by the Owner. The contractor is responsible for replacement of trees due to theft and vandalism until final acceptance of the project by the Owner after completion of the specified maintenance period.
- C. Replace plants which lose more than 30% of their original leaves within the below described time limits.
- D. Remove and replace plants within 15 days of notification which fail to conform. Replace with materials as originally specified. Guarantee for replaced materials shall begin with date of replanting and shall be as previously described.

1.8 SUBMITTALS

- A. Within the required time period stated, the Contractor shall submit six (6) copies of complete lists of proposed materials to Landscape Architect including source, manufacturers name and catalog numbers.
- B. Materials and equipment shall not be ordered until given written approval by Landscape Architect.
- C. The Contractor shall confirm availability of plant material, supplies and materials for inclusion in the submittal. If a plant is found not to be suitable or available, the Contractor is to submit a list of three to five appropriate substitutions that are available for selection by the Landscape Architect.

1.9 UNDERGROUND OBSTRUCTION

- A. The Contractor shall verify all underground obstructions and / or utilities, existing or proposed prior to making landscape excavations or installing tree stakes. Contractor shall avail themselves of any as built drawings of the site, Underground Service Alert (USA) 1-800-227-2600 and records of existing and proposed site work.
- B. If there is a conflict with the utilities and the planting, notify the Landscape Architect for a ruling prior to planting.

1.10 PROJECT CONDITIONS

- A. No plants shall be planted in situations that show obvious poor drainage. Such situations shall be brought to the attention of the Landscape Architect and Owner's authorized representative. Generally, the drainage problem is to be corrected prior to installing plant material.
- B. All landscape areas are to be deep ripped to a depth of twelve inches (12") below finish grade in two directions. All trees are to have 18" diameter drainage holes that are 10' deep.
- C. The Contractor shall guarantee repair of damage to any part of the premises resulting from leaks,

SECTION 329000
LANDSCAPE CONSTRUCTION

defects in materials, equipment or workmanship. The Contractor shall be liable for any and all accidents resulting from their work, including open holes and trenches during construction.

- D. During landscape construction operations keep hardscaped surfaces clean and work areas organized.
- E. Landscape concrete mow strips are to be installed so that they do not conflict with site drainage or impede drainage away from buildings. Generally, a minimum 2% slope away from buildings is to be maintained for positive site drainage. Concrete mow strips are not to trap water or cause puddling.

1.11 WORKMANSHIP

- A. The Contractor shall have experience and demonstrated ability in the installation of landscapes of this type. No work shall be completed without supervision by a qualified foreman. All work shall be installed by skilled persons proficient in the trades required, in a neat, orderly and organized manner, with the recognized standards of craftsmanship developed for the industry and as described in the plans, specifications and manufacturers installation instructions.

1.12 SOIL TESTING

- A. An independent soil testing laboratory (Dellavalle Laboratory, contact Chad Reenders (559) 922-9299, or approved equal) is to test the existing soil after rough grading operations are completed with a complete fertility assay to evaluate the soils ability to maintain and support the ornamental landscaping. Samples from two (2) locations on the site are to be taken, with two samples from each location, one at four (4") inches in depth, and the second at sixteen (16") inches in depth (four samples). The soil testing laboratory is also to complete a preliminary screening for detrimental agricultural chemical residue that may be present on site, if these results are positive, notify the Owners authorized representative for a ruling. The contractor is to pay for all required soil tests and consulting time with the soil scientist for detailed recommendations to be submitted to the Owners authorized representative for evaluation.
- B. After the soil amending and leaching process, if required, has been completed, the Contractor is to take additional samples from the two (2) locations on the site, with two samples from each location, one at four (4") inches in depth, and the second at sixteen (16") inches in depth (four samples) to evaluate the progress and effectiveness of the soil amending and leaching work. The contractor is to pay for all required soil tests and consulting time with the soil scientist for detailed recommendations to be submitted to the Owners authorized representative for evaluation.

1.13 CONSTRUCTION OBSERVATION

- A. The Contractor is to coordinate construction observation site visits with the Landscape Architect during the appropriate phases of construction, or as required by the Landscape Architect. The Contractor is to schedule site visits a minimum of one week in advance at the required phases of construction. The following outlines the phases of construction which require a site visit, however it is not limited to the following construction phases:
 - 1. Preconstruction meeting
 - 2. Staking of plant and tree locations prior to irrigation installation.
 - 3. Staking of sprinklers and mainline routing.
 - 4. Mainlines, wiring, lateral pipes, & valve manifolds prior to backfill.

SECTION 329000
LANDSCAPE CONSTRUCTION

5. Irrigation coverage test and rough grading.
6. Trees & plants prior to installation, still in containers.
7. Fine grading of turf areas prior to sod installation.
8. Substantial completion to start maintenance.
9. Final acceptance after successful maintenance period.

The Owner will pay for initial construction observation visits, however, any additional visits required due to non-compliance, incomplete work, or substandard performance will be paid by the contractor at a cost of \$900.00 per extra visit.

1.14 PROTECTION TO THE PUBLIC HEALTH AND WELFARE

- A. The Contractor in the course of their work shall make every effort to guard the public health, safety and welfare during construction. This shall include erection of barricades, night warning lights and all necessary devices required to protect the public health and welfare or as required by existing governmental codes. The Contractor shall accept any and all liabilities arising from accident or injury on the job and after construction. All equipment which protrudes above grade shall be installed against a structure or an appropriate barricade shall be erected to protect public safety.

PART 2 - MATERIALS

2.1 PLANTS

- A. Conform to list of plant materials on drawings. Contractor is to provide digital photos of representative example of each plant and tree type to be used and submit to Landscape Architect for review and comment. Plants and trees are also to be inspected when delivered to the site so non-conforming materials can be identified prior to planting.
- B. Plants shall be the best of their kind and class, and of optimum age, and in conformance with the standards of the American Society of Nurserymen.
- C. Plants shall have normal, well-developed branch systems and shall not be root or pot-bound. Do not prune or top trees prior to delivery.
- D. Delivery to be made not more than 2 days prior to installation unless nursery area approved by landscape architect is established.
- E. It will be the responsibility of the contractor to place material order(s) sufficiently in advance of planting to assure availability of plants in species and size specified. Substitutions for plants and trees will not be made due to lack of advance planning.
- F. No substitutions will be made without approval of the Landscape Architect or authorized representative.

2.2 SOIL AMENDMENTS

- A. Soil amendments (type and quantity) are to be based on the soil test results and recommendations by the soil testing laboratory. The contractor is to include the amendments outlined in part 3.03 of this Section in the bid price. Prices for the soil amendments are to be quoted as unit prices to be adjusted based upon the recommendation of the testing lab. The contractor is to pay for all required soil tests and consulting time with the soil scientist for detailed recommendations.

SECTION 329000
LANDSCAPE CONSTRUCTION

- B. Nitrified Aged Fir Bark Humus (forest product) as supplied by Superior Soil Supplements, Hanford, California, (559) 904-3372.
- C. Commercial fertilizer (15-15-15), Best Pre-plant fertilizer (6-20-20 XB), slow release fertilizer Best All Season (19-6-12) with Polyon 43.
- D. Gypsum (100% purity) and Elemental Soil Sulfur (100% purity) as supplied by Superior Soil Supplements, Hanford, California, (559) 904-3372.
- E. Plant fertilizer tabs: Agriform, Best-Tabs or approved equal, quantities as shown below: 1 gallon plant (2 tabs), 5 gallon plant (4 tabs), 15 gallon plant (6 tabs) & box size tree (8 tabs).
- F. Global Premium Humate as supplied by Superior Soil Supplements, Hanford, California, (559) 904-3372.
- G. Certificates: In addition to any certificates specified, the Contractor shall furnish a certificate with each delivery of bulk material stating the source, quantity, date, and type of material. All certificates shall be delivered to the Owners authorized representative at the time of each delivery.
- H. Samples: The contractor is to submit samples of the materials to be used for inspection and approval.

2.3 ACCESSORIES

- A. Tree Stakes: 2 inches by 2 inches by 10 feet long treated lodgepole or natural redwood. Use two stakes per tree. See the tree installation detail.
- B. Tree Ties: flexible vinyl "Cinch-Tie", manufactured by V.I.T. Products, San Diego, California, (619) 673-1760, and distributed by Horizon Sales, Pleasanton, California, (510) 462-6602. Use a minimum of four 24" ties per tree. See the tree installation detail.
- C. Tree String Trimmer Guard: polyethylene "Trim Guard", manufactured by V.I.T. Products, San Diego, California, (619) 673-1760, and distributed by Horizon Sales, Pleasanton, California, (510) 462-6602. Use one Trim Guard per tree in the lawn areas only.
- D. Tree Root Barriers: All trees within ten (10'-0") feet of a hardscaped surface, perimeter fence or building are to have root barriers installed that are 24" deep by 24" wide as manufactured by Root Solutions, Inc. and distributed by Vespro Inc., San Rafael, California, (415) 434-3072. Root barriers are to be installed so each fifteen gallon tree is to have up to 20 panels and box size trees are to have additional panels as required. If the concrete is only on one side of the tree, then 10 panels (centered on the tree) are to be installed in a straight line along the concrete or boundary as recommended by the manufacturer, or if the concrete is on two sides of the tree, then install 10 panels (centered on the tree) on two sides or 20 panels are to be installed around the perimeter of the concrete. Tree root barriers are NOT to be installed in a circular pattern around the tree, if concrete is on more than two sides of the tree add panels as required.
- E. Top Soil: If required, imported topsoil shall be natural, fertile, friable loam, capable of sustaining vigorous plant growth, free of subsoil, roots, grass, excessive amount of weeds, salt, stone and foreign matter; acidity range of pH 5.5 to 7.5; containing a minimum of 4% and a maximum of 25% organic matter. Obtain approval of the Landscape Architect or Authorized representative for placement. The contractor is to submit a topsoil sample to an approved testing lab for a complete fertility assay for approval prior to importing the material on-site.
- F. Import Soil: If required, imported fill dirt shall be tested with a fertility assay from Dellavalle

SECTION 329000
LANDSCAPE CONSTRUCTION

Laboratories to certify that the fill dirt is free of salt, boron or other deleterious minerals or matter prior to delivery and placement on the site. Contractor is responsible for all remediation required for the placement of substandard fill dirt containing salt, boron or other deleterious minerals or matter that may require the installation of additional soil amendments, leaching, additional soil testing, replacement of failed plant materials to bring the non-conforming soil into compliance at the Contractors sole expense.

- G. Other Materials: Materials not specifically indicated, but necessary for the proper execution of the work, shall be of first quality as selected by the Contractor subject to approval of the Landscape Architect.

2.4 WEED CONTROL

- A. Methods and chemicals shall be suitable with regard to season and shall control weeds and shall be approved by all governing agencies.
- B. Treatment shall not damage or impede growth of trees, shrubs, and ground covers to be planted, nor kill or damage any existing plant material specified to remain.
- C. Applicator shall be a licensed State of California Agricultural Pest Control Operator, Category E, or as required by all governing agencies.
- D. Contractor shall obtain required permits from County Agricultural Commissioner. Weed control treatment shall be in accordance with Federal, State of California, County and local codes and regulations, and shall be safe, not cause a health hazard, nor disrupt or inconvenience continuing business operations of the Owner and neighbors, public street, parking lot and sidewalk use or construction activities.
- E. Method of treatment shall be strictly in accordance with manufacturer's recommendations.
- F. Method of application and chemicals to be reviewed and approved by the Owners representative.
- G. Contractor shall ascertain and insure that all planted areas are weed-free prior to planting and maintain the site weed free during construction and maintenance periods.

2.5 STABILIZED DECOMPOSED GRANITE

- A. Gold decomposed granite is to be supplied by Rosenbalm Rockery, or approved equal and is to meet gradation specification as determined by ASTM C 136 methodology (Caltrans 202) with sand equivalent as determined by ASTM D 2419 methodology (Caltrans 217) and shall have a minimum of 30.
- B. Naturalseal is a stabilizing organic non-toxic binder, buff in color and without a marked odor. The swell volume shall have a minimum of 35 ml/g with a minimum mucilliod content of 80 percent. The light extraneous matter shall not exceed a maximum of 20 percent with the heavy extraneous matter not exceeding 5 percent. The material shall be screened with 90 – 100 percent passing a 200 mesh sieve.
- C. Decomposed granite is derived from the crushing and screening of naturally friable granite. The blending of course sand with rock dust is not an equal product. The granite is screened to include stone particles of 3/8" minus. The particles that pass the 200 screen mesh as determined by ASTM methodology shall not exceed 18 percent. The sand equivalent shall be a minimum of 30 and the R-value shall be a minimum of 70.
- D. Stabilizing organic binder Naturalseal as distributed by Rosenbalm Rockery Inc. shall have a

SECTION 329000
LANDSCAPE CONSTRUCTION

minimum swell volume of 32 ml/gm. The binder shall be incorporated with the granite fines by the use of a pug mill that includes a weight belt feeder that insures the proper ratio of binder to granite fines. Blending with the use of a bucket loader or similar is not acceptable. For pathways the binder shall be blended at the rate of 12 lbs per ton of granite fines. For parking lots or roadways the binder shall be incorporated at the rate of 14 lbs per ton.

- E. For pathways, stabilized decomposed granite shall be placed to a minimum depth of 3" compacted thickness. For driveways or vehicular roadways stabilized decomposed granite shall be placed to a minimum depth of 4" compacted thickness.
- F. For each 2" lift evenly spread the material over designated area. Grade and smooth as outlined on the plans. Thoroughly water entire area so that the entire depth of the material is moist. After a period of +/- 6 hours compact the final lift with a 1,000 – 3,000 lbs static drum roller. Allow for a sufficient curing period of +/- 4 days prior to use.

PART 3 - EXECUTION

3.1 SITE INSPECTION

- A. Locate cables, conduit, piping, and other obstacles prior to beginning excavation. Notify Owners representative of obstacles requiring relocation.
- B. Remove rocks and other similar underground obstructions to depths necessary to permit proper installation of lawns and planting.
- C. Verify that landscape irrigation system has been properly installed and is fully operational.
- D. Verify dimensions shown on plan and notify Owners representative of any discrepancy.
- E. Review plant list and consult Owners representative with any questions or concerns.

3.2 GRADING

- A. Contractor is to remove weeds and debris from site prior to starting grading operations and is to maintain the site weed free throughout the progress of construction.
- B. Contractor is to work soil in a manner which does not cause excessive compaction or clods which will not break easily. Apply water as necessary to obtain optimum moisture content for tilling and planting. The Contractor is to coordinate deep ripping of all landscape areas to a depth of twelve inches (12") to break up compacted areas to improve drainage.
- C. After the grades have been reestablished after irrigation trench backfill and prior to planting, the Contractor is to heavily irrigate the site to the point of producing runoff to verify that the site is free draining without puddles or low spots. Contractor is to address grading problems and repeat the test until all puddles and areas of standing water drain within one half hour (1/2 hr). Contractor is to fill settled areas as required. Planting shall not proceed until all grading corrections have been completed and the areas have been retested to confirm conformance.
- D. The contractor is responsible for the grading of all planting areas. The grades shall be gently flowing with no abrupt changes. The contractor is responsible to insure that the planting areas have adequate soil and is to fill low areas as needed. The contractor is to grade the areas to drain as intended by the site grading plan by the Project Civil Engineer. Typically the planter areas are to be slightly crowned or cross sloped to insure positive drainage away from planted areas to the perimeter to drain as intended by the Site Drainage Plan. No standing water will be permitted in

SECTION 329000
LANDSCAPE CONSTRUCTION

planter areas where plants and trees are located. Slope surfaces away from buildings at a 2% slope with no pockets of standing water. The contractor is responsible for all import or export of soil and removal of debris, trash, or other elements off site at Contractors expense to provide the Owner with a completed landscape project at no additional cost to the Owner.

- E. Provide neat, smooth, and uniform finish grade. Final soil elevations in perimeter areas are to be as noted below. Grades may taper from perimeter areas over a smooth gradual transition.
 - 1. Turf Areas: 1" below the adjacent sidewalks or other hardscape features.
 - 2. Planter Areas: 1 1/2" to 2" below the adjacent sidewalks or other hardscape features.
- F. Notify Owners representative upon completion of grading for approval and to verify the smoothness and accuracy of fine grading and clod-free condition of planting surface. No planting is to be started prior to obtaining the approval of the fine grading from the Owners authorized representative.
- G. Install concrete mow strips between all turf and planter boundaries. Install the mow strips as shown in the Concrete Mow Strip Detail and as outlined in the project plans and specifications. Contractor is to insure that concrete mow strips do not interfere with site drainage and do not trap water or cause puddling.

3.3 SOIL PREPARATION

A. Soil Amendments, Cultivation and Weed Control:

- 1. The contractor is to cultivate the soil amendments into the top eight (8") inches of soil. The following soil amendment types and quantities are to be included in the bid. Pending the results of the soil tests, and recommendations of the soil testing laboratory, adjustments to the types and quantities of soil amendments to be used may be necessary. The contract price will be adjusted according to the actual soil amendments installed on the project. The contractor is to include the following soil amendments as part of the bid:

a. Lawn Areas:

- 1) Pelletized Gypsum (100% purity) (Preplant), (2 tons per acre).
- 2) Tiger 90CR Soil Sulfur (100% purity) (Preplant), (1/2 ton per acre).
- 3) Best Triple Pro Fertilizer (Preplant) - (15-15-15), (500 lbs per acre).
- 4) Best Preplant Fertilizer (Preplant) - (6-20-20 XB), (500 lbs per acre).
- 5) Global Premium Humate (Preplant), (250 lbs per acre).
- 6) Best All Season Fertilizer with Polyon 43 (Maintenance) - (19-6-12), maintenance applications and rates as follows:

Hydroseeded Turf Areas: (130 lbs per acre) per maintenance application. Minimum of seven (7) maintenance applications required for bid. Fertilize hydroseeded areas every other week as noted. Actual application will conform to soil test results.

Sodded Turf Areas: (200 lbs per acre) per maintenance application. Minimum of four maintenance applications required for bid. Fertilize sodded areas monthly. Actual application will conform to soil test results.

- 7) Pelletized Gypsum, (Maintenance) - (1 tons per acre). One maintenance application required for bid. Actual application will conform to soil test results.
- 8) Global Premium Humate, (Maintenance) - (250 lbs per acre). One

SECTION 329000
LANDSCAPE CONSTRUCTION

maintenance application required for bid. Actual application will conform to soil test results.

- b. Planter Areas:
- 1) Nitrified Aged Fir Humus (forest product) (Preplant), (4 cu. yds. per 1000 sq. ft.).
 - 2) Pelletized Gypsum (100% purity) (Preplant), (2 tons per acre).
 - 3) Tiger 90CR Soil Sulfur (100% purity) (Preplant), (1/2 ton per acre).
 - 4) Best Triple Pro Fertilizer (Preplant), (15-15-15), 500 lbs per acre.
 - 5) Best Preplant Fertilizer (Preplant), (6-20-20 XB), (500 lbs per acre).
 - 6) Global Premium Humate (Preplant), (250 lbs per acre).
 - 7) Best All Season Fertilizer with Polyon 43 (Maintenance) - (19-6-12), maintenance applications and rates as follows:

Planter Areas: (200 lbs per acre) per maintenance application. Minimum of four maintenance applications required for bid. Fertilize planter areas monthly. Actual application will conform to soil test results.

- 8) Pelletized Gypsum, (Maintenance) - (1 tons per acre). One maintenance application required for bid. Actual application will conform with soil test results.
- 9) Global Premium Humate, (Maintenance) - (250 lbs per acre). One maintenance application required for bid. Actual application will conform to soil test results.

The Owners authorized representative and Contractor shall negotiate the differences in costs according to the materials required based upon the recommendations of the soil testing laboratory. No labor difference in cost will be allowed for application of the corrected materials to be used.

2. Soil Amending – Application #1: If salt is present in the soil test results, Contractor is to apply and incorporate the following soil amendments into the soil – Gypsum, Soil Sulfur and Nitrified Aged Fir Humus (planter areas only). Contractor is to reestablish site grades (smooth areas without displacing amendments) and leach the soils for four to six weeks.
3. Contractor is to retest the site soils as noted in 1.12 (B) above, if salt is present in the soil test results and leaching is required.
4. Soil Amending – Application #2: Contractor is to apply and incorporate the following soil amendments into the soil – Preplant Fertilizers and Humate amendments. Contractor is to reestablish site grades (smooth areas without displacing amendments) and leach the soils for one to two weeks.
5. If there are no or low salts in the soil test reports and leaching is not required, then the Contractor can combine Preplant Soil Amendment Applications #1 & #2 and delete the leaching requirement and issue a credit to the District.
6. After cultivation, water the site until the first weed crop is established. Cultivate or treat with chemicals to assure a weed-free condition.
7. Planting beds may be established after the second cultivation and final fine grading has been inspected and approved.

SECTION 329000
LANDSCAPE CONSTRUCTION

- B. Planting holes:
1. All 15 gallon size trees or larger, are to have one 18" diameter hole drilled up to ten (10') deep to insure proper drainage. Holes are to be off set with tree root balls "benched" into the top of the hole to prevent the tree against settlement.
 2. Holes are to be excavated three times the size of the rootball. The contractor is to slightly off-set the drainage holes to prevent settling of plants after installation. The contractor is to guarantee that the trees and shrubs will not settle below grade. Trees in turf grass areas are to be planted after the hydroseed and sod has become established and no longer requires excessive irrigation, which may cause undue stress to the trees.
 3. Holes are to be in damp (but not saturated) and friable condition with all hidden obstructions removed before planting. The backfill is to be mixed thoroughly as specified adjacent to the planting hole prior to planting.
- C. Leaching: Leaching of the soils is a critical element in how fast the soils will be reclaimed. The Contractor is to expedite the irrigation installation during the early stages of the project to allow leaching operations with the irrigation system at the earliest possible time in the project schedule. The Contractor is to provide labor and materials as needed to leach soils with irrigation water in areas that will not delay the progress of other site improvements. During leaching operations, the Contractor is to maintain the soil saturated while limiting runoff. Contractor is to monitor depth of soil saturation to plan periods of drying appropriately.
- Contractor is responsible for temporary measures required to retrofit the planter area irrigation system for leaching by installing spray nozzles on bubbler pop ups, installing temporary sprinklers, relocating sprinkler or other improvements required to insure good coverage of all planter areas for the purposes of leaching. Once leaching has been completed, contractor is to remove temporary improvements and restore the system to conform to the project documents.

3.4 PLANTING

- A. Water plants immediately upon delivery to site. Maintain in moist condition until planted.
- B. Space plants uniformly as shown on plans. The Contractor is to stake the locations of plants and tree locations prior to layout of irrigation system for review and approval by the Landscape Architect in the field prior to trenching. Contractor is to use color coded flags to stake plant materials by variety. After the plant layout has been approved, the Contractor is to stake the bubbler locations for each plant and tree. Bubblers are to be located on the uphill side of the plant within the plant basin. Landscape Architect may move, add or delete plants or trees in the field and the Contractor is to adjust the work as required at no additional cost to the District. Contractor is not to proceed with irrigation or planting operations, until the planting locations have been approved by the Landscape Architect in the field.
- C. Cut cans by cutting vertically on two opposite sides of can with can cutter, or as recommended by the nursery for the type and size of containers supplied with the plant materials. Do not damage plant.
- D. Plant immediately after removal from the can or flat. Position the top of the plant root ball 1" above finish grade. Backfill as follows:
1. (85%) native soil.
 2. (15%) nitrified humus.

SECTION 329000
LANDSCAPE CONSTRUCTION

3. Azaleas and camellias are to have an additional 2 cu. ft. Camellia Mix in backfill.
4. Agriform / Best plant tabs as indicated on plans. Place plant tabs beside root ball as recommended by the fertilizer manufacturer. Construct a watering well one foot radius from stem or trunk that will allow water to fill well at least 3" deep for shrubs and two foot radius from trunk that will allow water to fill well at least 4" deep for trees. Fill water well at least six times by hand after planting.
- E. Fertilize all ground cover areas with post-plant commercial slow release fertilizer 19-6-12 upon completion of planting, and every 30 days through the first growing season at a rate of 5 lbs per 1000 square feet, or as recommended by the soil test results.
- F. At completion of planting, all non-turf planted areas are to receive a three inch (3") layer of topdressing mulch of premium walk on bark as supplied by Superior Soil Supplements, (559) 904-3372. Wash excess bark off leaves and do not engulf stems of plants and ground cover.
- G. Lawn Installation (Hydroseed):
 1. The turf areas, as indicated on the plans, shall be hydroseeded in one operation after all trees, weed removal, soil preparation, grading, scalping, verticutting and irrigation system work have been completely installed, inspected and approved.
 2. Hydromulch mixing shall be performed in a tank with a built-in continuous agitation and recirculation system of sufficient capacity to produce a homogeneous slurry of fiber, fertilizer, water, and additives in the specified proportion. Hydroseeding Slurry Mix:
 - a. Mulch: Agrono-Mulch @ 1500 lbs per acre. As distributed by Agrono-Tec Seed Co., Fresno, California, (559) 277-2444.
 - b. Binder: Agrono-Tac @ 120 lbs per acre.
Fiber Plus @ 25 lbs per acre.
 - c. Fertilizer: Soluble time release granular mixture of 24-4-8 @ 250 lbs per acre.
 - d. Seed – Bermudagrass Turf: Yukon Bermudagrass (4 lbs per 1,000 sq ft) and Perennial Ryegrass (8 lbs per 1,000 sq ft) Blend. Seed at a rate of 12.0 lbs per 1,000 sq ft.
 3. The final seed mix is subject to change. Verify the final approved seed mixes with the Owners authorized representative prior to seeding. The seed mix will be adjusted to account for the use, drought tolerance, and the time of year to be installed.
 4. The area to be seeded shall be slightly moist after the last watering and final weeding operations. The grading must be approved prior to hydroseeding. The site must be free draining prior to hydroseeding.
 5. The area to be seeded shall be hydromulched with a discharge system that will apply the slurry to the areas to be treated at a continuous, uniform rate. The tank shall have a minimum capacity of 1000 gallons. Nozzle applying the slurry shall be held close enough to the areas to be planted to distribute the slurry in a uniform coating on the surface. A green marker dye shall be used to show such coverage.
 6. The allowable planting window for hydroseed starts on April 1st and extends thru July 30th annually. Planting after July 30th or before April 1st requires written permission of the District and seed mix may be changed at no additional cost to the project. Do not plant in excessively hot weather or when unseasonably hot weather is forecast soon.
 7. The turf area establishment work is to proceed as follows. Time periods noted are from the

SECTION 329000
LANDSCAPE CONSTRUCTION

date of hydroseed planting.

- a. Weeks 1 thru 4: Fertilize once (week 3 or week 4) with Best 19-6-12 with polyon 43 at a rate of 3.0 lbs per 1,000 sq ft (130 lbs per acre) to keep hydroseed in a healthy growth state and mow once (week 4) with reel mower with roller (Toro 5210, or approved equal) to stimulate the lateral turf growth and increase density.
 - b. Weeks 5 thru 15: Fertilize every other week (weeks 6, 8, 10, 12 & 14) with Best 19-6-12 with polyon 43 at a rate of 3.0 lbs per 1,000 sq ft (130 lbs per acre). Mow 2 times weekly with reel mower with roller (Toro 5210, or approved equal) to stimulate the lateral turf growth and increase density. Mowing height to be 5/8" to 3/4" of an inch.
 - c. Weeks 16 thru 17: Fertilize as required to keep turfgrass in a healthy condition. Mow 1-2 times weekly with reel mower with roller (Toro 5210, or approved equal) and raise turfgrass mowing height to 1" to complete the maintenance period.
8. A minimum of one trained workman shall be on the site 2 hrs per day (minimum or as required) after hydroseeding and through the maintenance period. The hydroseeded areas shall be watered immediately and kept damp during the entire germination period. Areas that are drying out too soon due to wind or other causes shall be watered by hand until the whole grass area comes up in a uniform and even covering of grass. Care shall be used to not overwater, which would create erosion. All erosion scars are to be repaired the same day.
 9. The contractor is to carefully observe the newly planted grass to keep moist and in a healthy growing condition. The contractor is to water and fertilize as needed to keep the turf in a vigorous healthy condition.
 10. The contractor is to protect the newly seeded area from foot traffic as needed. The contractor is to continuously reseed and repair damaged areas. The turf areas, as indicated on the plans, shall be hydroseeded in one operation after all weed removal, soil preparation, grading and irrigation system have been completely installed and approved. Trees are to be installed after the turf has been established. Stake tree locations during turf establishment.

H. Lawn Installation (Sod):

1. The turf areas, as indicated on the plans, shall be sodded (big rolls where possible) in one operation after all weed removal, soil preparation, grading and irrigation system have been completely installed and approved. Trees are to be installed after the turf has been established. Stake tree locations during turf establishment.
2. The allowable planting window for sod starts on May 1st and extends thru August 30th annually. Planting after August 30th or before May 1st requires specified sod that is overseeded with perennial ryegrass at no additional cost to the project. Do not plant in excessively hot weather or when unseasonably hot weather is forecast soon.
3. Finish grade is to be smooth and firm to prevent differential settlement. Sod is to be laid in staggered rows (brick like pattern). Edges are to be firmly butted together to insure soil to soil contact between sod pieces. Sodded areas are to be rolled (water roller) to remove air pockets and insure good soil contact.
4. The area to be sodded shall be slightly moist after the last watering and final weeding operations. The grading must be approved prior to sodding. The site must be free draining prior to sodding.
5. The turf area establishment work is to proceed as follows. Time periods noted are from the

SECTION 329000
LANDSCAPE CONSTRUCTION

date of sod planting.

- a. Weeks 1 thru 4: Fertilize once (week 2 or week 3) with Best 19-6-12 with polyon 43 at a rate of 4.6 lbs per 1,000 sq ft (200 lbs per acre) to keep sod in a healthy growth state and mow once per week.
 - b. Weeks 5 thru 12: Fertilize twice (weeks 7 & 12) with Best 19-6-12 with polyon 43 at a rate of 4.6 lbs per 1,000 sq ft (200 lbs per acre). Mow 1 time weekly. Mowing height to be 3/4" to 1" inches.
 - c. Weeks 13 thru 17: Fertilize once (week 16 or week 17) to keep turfgrass in a healthy condition. Mow 1 time weekly and raise turfgrass mowing height to 1" to complete the maintenance period.
6. A minimum of one trained workman shall be on the site 2 hrs per day after sodding and through the maintenance period. The sodded areas shall be watered immediately and kept damp during the entire establishment period. Areas that are drying out too soon due to wind or other causes shall be watered by hand until the whole grass area is established in a uniform manner. Care shall be used to not overwater, which would create erosion and fungus. All erosion scars are to be repaired the same day.
 7. The contractor is to carefully observe the newly planted grass to keep moist and in a healthy growing condition. The contractor is to water and fertilize as needed to keep the turf in a vigorous healthy condition.
 8. The contractor is to protect the newly sodded area from foot traffic as needed. The contractor is to continuously resod and repair damaged areas as required.

3.5 STAKING AND TYING

- A. Remove nursery stakes and ties.
- B. Install tree stakes 18" deep on windward and leeward sides of tree and tie to tree with 4 ties. Install ties loose enough to avoid injuring cambium layer of tree and to allow limited movement.
- C. Remove nursery ties from shrubs and espaliered plants and install new plastic ties in a loose manner so new plant growth will not girdle the branch or stem.

3.6 MAINTENANCE

- A. Maintain planted areas during the progress of the work and through the maintenance period. A minimum of one trained workman shall be on the site 2 hrs per day after planting until the fourth mowing and as needed through the maintenance period.
- B. The maintenance period begins when the work is substantially completed and accepted by the Owner. The turf areas are to be completely planted and show active growth and reasonable coverage before the specified maintenance period can begin. The maintenance period shall be for one hundred twenty days (120) days, after substantial completion by the Owner. The Owner and Landscape Architect shall be notified a minimum of 10 days prior to the time that the work is ready for final inspection. This final inspection is required before the maintenance period can begin. The contractor is responsible to provide all materials and labor to maintain the site for the maintenance period at no cost to the Owner. The maintenance period may be extended at no cost to the Owner should prevailing site conditions not warrant final acceptance by the Owner. The site should be in a weed free condition, the lawns should be established, vigorous, have minimum 99% coverage, be weed free, and fertilized, and all plants and trees are to be in good condition. The maintenance period will be extended in one month increments until the Contractor brings the site into compliance

SECTION 329000
LANDSCAPE CONSTRUCTION

at no additional cost to the Owner.

- C. During the maintenance period the contractor shall provide the following services but is not limited to the services outlined below.
1. Maintain surfaces and supply additional top soil where necessary, including areas affected by erosion.
 2. Water to ensure uniform stolon growth and to keep surface of soil damp. Fertilize as specified on a monthly, or as needed basis.
 3. Apply water slowly so that surface of soil will not puddle and crust.
 4. Maintain turf & planted areas weed free. Hand weed or use chemicals at the Contractor's option.
 5. Mow and maintain the turf areas, and pick up grass clippings to be hauled off site at the Contractors expense.

3.7 CLEAN-UP

- A. Remove rubbish, trash, and debris resulting from the operation at the end of each working day.
- B. Wash paved surfaces clean.
- C. Maintenance period will begin with acceptance of installation by the Owner and will continue as noted in article 3.06.

3.8 EXTRA LANDSCAPE MATERIALS

- A. Contractor shall supply the following extra materials to be installed at the direction of the Landscape Architect during the project at any time. Each item is to include all associated materials (landscape and irrigation) and all appurtenances associated with the item, including material, labor and equipment costs for a complete installation in accordance with the project documents at no additional cost to the Owner. Should any items not be installed as part of the project, the remaining items are to be delivered to Owner or a credit issued at the Owner's option as part of the project completion documentation.

1. Five (5): One gallon size plants (Variety to be determined in the field)
2. Five (5): Five gallon size plants (Variety to be determined in the field)
3. Three (3): Fifteen gallon size trees (Variety to be determined in the field)

All work is to be in compliance with all project specifications and construction details at no additional cost to the Owner.

-- END OF SECTION --

SECTION 331000
WATER DISTRIBUTION

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. Pipe and fittings for water piping.
 - 2. Valves.
 - 3. Valve boxes.
 - 4. Accessories.
- B. Related Sections:
 - 1. Division 31 Section "Trenching."

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 through 48 in 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. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- C. Project Record Documents: Submit under provisions of Division 01.
 - 1. Accurately record actual locations of piping mains, valves, connections, and appurtenances.
 - 2. Identify and describe discovery of uncharted utilities, or utilities found at locations different than indicated on plans.

1.5 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle all products required.

PART 2 - PRODUCTS

2.1 PIPE MATERIALS

- 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" and smaller, underground): ASTM D1785, Schedule 40; 1120 high impact.
 - 1. Fittings: ANSI/ASTM D2464, Schedule 80 PVC (Schedule 40 PVC for pipes 1 ½ inches and smaller).
 - 2. Joints: ASTM D2855, solvent weld.
- C. PVC Pipe (for pipe 4" and larger, underground): ANSI/AWWA C900 Class 200, 1120 high impact.
 - 1. Fittings: ANSI/AWWA C111, cast iron.
 - 2. Joints: ASTM D3139 compression gasket ring.

2.2 VALVES

- A. General: Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, IPS ends.
- B. Valves Up to 2 inches: Full port ball valves.
- C. Valves 2-1/2 inches and Larger: Gate valves, ANSI/AWWA C509, Iron body, bronze trim, non-rising stem with square nut or control handle wheel, resilient single wedge, threaded or flanged, epoxy lined.

2.3 VALVE BOXES

- A. Valve Boxes and Covers: Precast reinforced concrete with cast iron lid marked for service, Christy No. G5 traffic box or approved equal. Cover marking shall read "Water".
 - 1. A one-piece PVC riser extension shall be provided as necessary to allow unobstructed access to valve operating nut.

2.4 ACCESSORIES

- A. Concrete for Thrust Blocks and Valve Box Surface Collars: Concrete type specified in Division 03 Section "Cast-in-Place Concrete".
- B. Concrete pad and guard post for the fire hydrant shall be as per detail drawing.
- C. Solvent Cement and Primer for PVC Pipe and Fittings: Per ASTM F656 and ASTM D2564.
- D. Construct blow-off assembly as indicated on Drawings.
- E. Furnish and install reduced pressure backflow preventers as indicated on Drawings.
- F. Furnish and install fire main and appurtenances as indicated on Drawings and per the governing Fire Department Standards.

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 Inspector.
- B. 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 Architect.

3.2 PREPARATION

- A. Prepare for pipe installation by assembling all needed materials.
- B. Cover all PVC pipe during storage.

3.3 TRENCHING

- A. Trenching shall be in accordance with Division 31 Section "Trenching."

3.4 BEDDING

- A. Pipe bedding shall be per pipe manufacturer recommendations and City/County Standards and Specifications.
- B. Where trench or pit has been over excavated, place bedding material at bottom of excavations, level soil materials in continuous layers not exceeding 6 inches uncompacted depth.
- C. Backfill around sides and to a level six 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.

3.5 INSTALLATION, PIPE AND FITTINGS

- A. Install pipe at locations and depths indicated on Drawings.
- B. Install pipe, fittings, and associated materials in accordance with manufacturer's written 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 as indicated on Drawings. Establish elevations of buried piping to ensure not less than 24 inches of cover, except at connections to existing lines, which may be shallower or deeper, or where shown otherwise on Drawings.
- F. When two water pipes are to be installed in same trench, maintain 4-inch horizontal clearance between pipes.
- G. Backfill trench or other excavation in accordance with Division 31 Section "Trenching".

3.6 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 as indicated on Drawings.
- 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 Owner.

3.7 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.

3.8 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect all domestic water piping systems in accordance with AWWA Standard C601, "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 Architect. During procedure signs shall be posted at each water outlet stating, "Chlorination - Do No 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 Architect.
- B. Additional disinfection requirements per the authorities having jurisdiction may exist. Contractor shall review City/County standards and specifications and coordinate with appropriate agency.

3.9 FIELD QUALITY CONTROL

- A. Follow City/County standards for additional testing specifications.
- B. Test completed piping systems according to requirements of authorities having jurisdiction.
- C. Do not enclose, cover, or put into service before inspection and approval.

- D. Field inspection will be performed under provisions of Division 01 General Requirements Sections.
- E. Compaction testing will be performed in accordance with ASTM Test Method D1557.
- F. If compaction tests indicate Work does not meet specified requirements, recompact and retest at no additional cost to Owner.
- G. If tests indicate that Work does not meet specified requirements, remove work, replace and retest at no additional cost to Owner.

END OF SECTION

SECTION 333000
SANITARY SEWERAGE

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. Furnish and install site sanitary sewer collection systems and associated accessory items as shown on the Drawings and as specified herein. Items include, but are not necessarily limited to, the following:
 - 2. Sanitary Sewer Pipelines and Services.

- B. Related Sections:

- 1. Division 31 Section "Trenching."

1.3 REFERENCES

- A. American Water Works Association (AWWA).
- B. American Society for Testing and Materials (ASTM):
- C. Designation D3034 - Polyvinyl Chloride (PVC) pipe SDR-26.

1.4 SUBMITTALS

- A. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.
 - 1. 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.

1.5 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.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleanout Boxes shall be precast reinforced concrete and cast iron lid marked for sewer service. Christy G5 or approved equal.
- B. Sanitary sewer pipelines shall be polyvinyl chloride (PVC) pipe for sanitary sewers conforming to ASTM Designation: 3034, SDR26 for 4" and larger and be Schedule 40 PVC pipe, ASTM D1785, 1120 high impact, for 3" and smaller.
- C. Concrete for structures shall conform to Division 03 Section "Cast-in-Place Concrete".

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 Inspector.
- 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. 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.

3.2 TRENCH EXCAVATION

- A. Trench excavation and backfilling shall be in accordance with Division 31 Section "Trenching."

3.3 PIPE INSTALLATION

- A. Pipe bedding shall be per pipe manufacturer recommendations and City/County Standards and Specifications.

- B. Pipe Laying: Sewer pipe shall be laid in strict conformity to the prescribed line and grade, with grade bars set and each pipe length checked to the grade line. Three consecutive points on the same rate of slope shall be used at all times to detect any variation from a straight grade. In case any discrepancy exists, the work shall be stopped and the discrepancy immediately reported to the Architect. In addition, when requested by the Architect, a string line shall be used in the bottom of the trench to insure a straight alignment of the sewer pipe between manholes. The elevation of the pipe invert shall not deviate from the design elevation by more than +2 percent to the pipe size concerned, or 1 inch, whichever is greater. The rate of deviation from grade or returning to grade shall be limited to 1/16 inch per foot of pipe.
- C. 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.
- D. Where plain end vitrified clay pipe with the compression coupling is installed, the contractor shall tighten the compression bands as pipe lying process. The first length of pipe laid on any run, except where a connection is made to an existing line, shall be anchored securely to prevent movement when each succeeding length is pushed home. After each compression band is torqued, the Contractor shall replace and tamp any bedding material that may have been displaced under the pipe and particularly under the coupler before proceeding with the initial backfill.
- E. All joint surfaces shall be cleaned before joints are made.
- F. 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.
- G. 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 Architect 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.

- H. As soon as possible after the completion of the pipe cleaning, and prior to final acceptance, the Architect may make a visual internal inspection of the new pipeline either manually or with television equipment.

3.4 CLEANOUTS

- A. Install cleanouts at locations shown on the Plans. Locate cleanouts in accessible locations and bring flush to finished surface.

3.5 TESTING OF SANITARY SEWERS

- A. Follow City/County standards for additional testing specifications.
- B. After cleaning, 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.

3.6 ADJUSTMENT

- A. Adjustment of sewer manholes and cleanouts to finish grade shall be as per the Drawings.

3.7 CLEAN-UP

- A. Remove from the site all rubbish, debris, etc. 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 334000
STORM DRAINAGE FACILITIES

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. Locating existing utilities.
2. Furnishing and installing storm drainage facilities, including pipe, manholes, cleanout and inlet and outfall structures.
3. Placing and compacting pipe bedding.
4. Final backfilling, compaction and grading.

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete."
2. Division 31 Section "Earthwork."
3. Division 31 Section "Trenching."

1.3 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.

1.4 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. California Test Method No. 216 (Dry Method).

1.5 SUBMITTALS

- A. Product Data: Provide data indicating pipe, accessories, and associated equipment to be furnished.
- B. Certificates of compliance for material.
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install products supplied.

1.6 COORDINATION

- A. Verify that the location of existing utilities have been indicated at work site by utility authorities and Campus personnel.
- B. Coordinate work with other project work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Reinforced Concrete Pipe for pipe larger than 12": 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 for pipe 12" or less.
- C. Precast Reinforced Concrete Manhole Sections: Per ANSI/ASTM C478. Elliptical single line reinforcement is not allowed and as shown on detail drawing.
- D. Cast in Place Concrete: Per Division 03 Section "Cast-in-Place Concrete."
- E. Steel Reinforcement: Per Division 03 Section "Cast-in-Place Concrete."
- F. Mortar: Composed of one part, by weight, portland cement (Type II low alkali per ASTM C150), 2 parts, by weight, sand, and water.
- G. Manhole Frames, Covers and Grates: Cast Iron per ASTM A48, Class 25.
- H. Storm drain inlet shall be Christy U-23 and V-12 drain inlet with precast extension as required. Contractor shall also construct concrete bottom as shown on detailed drawing.
- I. Soil Fill for Concrete Pipe Bedding Envelope: Type S2 or S4 per Division 31 Section "Soils for Earthwork."
- J. Concrete collar shall be constructed as per detailed drawing.
- K. Cleanout shall be constructed as per detail drawing.

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 Inspector.
- 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. 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 Architect.

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. Remove all interfering surface and subsurface improvements authorized for removal.

3.3 TRENCH EXCAVATION

- A. Trench excavation and backfilling shall be in accordance with Division 31 Section "Trenching."

3.4 INSTALLATION AND BEDDING OF STORM DRAIN PIPE

- A. Pipe bedding shall be per pipe manufacturer recommendations and City/County Standards and Specifications.

- B. Install the pipe and fittings to the lines and grades shown on the construction plans.
- C. Install pipe and fittings in accordance with the manufacturer's recommendations, and these specifications.
- D. Unless otherwise approved by the Architect, lay all pipe upgrade from structure to structure, with bell or socket ends of pipe upgrade.
- E. 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.
- F. Ensure that all joints are properly "homed" and are watertight.
- G. Bed concrete pipe in Type S2 or S4 soil envelope, and compact to a minimum of 85% relative compaction. Place and compact the bedding material under, around and over the pipe, filling the trench cavity and extending from the bottom of the trench (4 inches below the outside bottom of the pipe barrel) to a level 12 inches above the outside top of the pipe barrel.

3.5 INSTALLATION OF STORM DRAINAGE STRUCTURES AND APPURTENANCES

- A. Install storm drainage structures as indicated on the construction plans, in accordance with the manufacturer's recommendations, and as specified herein.
- B. Key top of poured-in-place concrete bases for structures to receive the tongue of precast riser sections.
- C. Joint precast manhole and structure riser sections with a minimum thickness of 1/2 inch of mortar to make a watertight joint. Neatly point the inside and outside of the joint. Set sections plumb.
- D. Construct cleanout, outfall structure per Drawings.

3.6 BACKFILLING TO FINISH GRADE AND FINISH GRADING

- A. Place and compact backfill per Division 31 Section "Trenching."
- 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:
- B. Above grade: Not to exceed 1/4 inch above planned grade.
 - 1. Below grade: Not to exceed 1/2 inch below planned grade.
 - 2. Alignment: Not to exceed 2 inches from planned alignment, if gradual and regular over a distance of 20 feet.
- C. 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 as required by authorities having jurisdiction.
- 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.

END OF SECTION

APPENDIX 01

GEOTECHNICAL SUMMARY

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1.1 Overexcavation

Areas to support proposed hardscapes, and any improvements susceptible to vertical movement should be overexcavated to a minimum of 12 inches below existing grade or finished rough subgrade. The limits of overexcavation should extend at least two feet horizontally from the edges of planned slabs.

After removal of the upper 12 inches of native soil and processing of the underlying 6 inches (Section 6.2.3), the site may be brought to grade with engineered fill.

The upper 12 inches of finish subgrade consist of compacted non-expansive soil ($PI < 8$) beneath the proposed structure, hardscapes, and any improvements susceptible to vertical movement.

Additional overexcavation may be required depending on conditions observed by the Geotechnical Engineer in the field during construction. The depth and extent of required overexcavations should be approved in the field by the Geotechnical Engineer prior to placement of fill or improvements.

(Project specific) At tree locations, deep stripping will be required to remove the root systems during site grading. A depth of 3 to 4 feet should be assumed. All roots greater than 1/2-inch in diameter should be removed by either mechanical means or by hand during grading operations.

All modular foundations should be founded a minimum depth of 36 inches below current grade (existing turf grade), or 30 inches below lowest adjacent final subgrade elevation, whichever is deeper. In addition, perimeter footings should be continuous, and interior footings must meet the 30-inch embedment depth below final subgrade elevation of the crawl space. The embedment depth of the interior side of the exterior continuous footing may be reduced to 24 inches provided the exterior side of the footing meets the 30-inch embedment and minimum 36-inch criteria stated above. The limits of overexcavation should extend at least five feet horizontally from the edges of planned slabs.

1.2 Subgrade Preparation

Following overexcavation beneath the proposed structure, hardscapes, and any improvements susceptible to vertical movement, the exposed subgrade should be scarified to a depth of 6 inches, uniformly moisture conditioned to between 3 to 5 percent over optimum moisture, and compacted to achieve a relative compaction of between 90 and 95 percent of the ASTM D1557 maximum dry density.

Field density tests should be taken to verify compaction of the prepared subgrade in these areas.

Following site stripping, all subgrade soils to support AC pavements should be scarified to a minimum depth of 12 inches below the finished subgrade elevation, uniformly moisture conditioned to between 3 and 5 percentage points above the optimum moisture content, and compacted as engineered fill to at least 95 percent relative compaction in accordance with CAL 216.

1.3 Import Fill materials

Engineered fill used for the project should be either 1) select import, or 2) general on-site soils with less than 3% organic content.

Select import should be inorganic, have an R-value of at least 50, a liquid limit less than 30, and a plastic index less than 8 ($PI < 8$). In addition, select import engineered fill should meet the following particle-size gradation:

<u>Sieve Opening</u>	<u>Percent Passing, by Dry Weight</u>
3 -inch square	100
3/4-inch square	70 minimum
U.S. No. 4	65 minimum
U.S. No. 200	45 maximum

Fill material that does not meet the above criteria should be tested under the direction of a Geotechnical Engineer to determine if it has engineering properties equivalent to, or better than, the existing site materials. Samples of any proposed imported fill material should be submitted to a Laboratory for testing and approved by a Geotechnical Engineer prior to being brought to the site.

General on-site engineered fill should be inorganic, contain no rocks greater than 4-inches in least dimension, and be free of deleterious materials. Soils containing more than 3 percent by weight of organic material should be considered organic.

1.4 Engineered fill placement

Engineered fill should be placed in a series of horizontal layers not exceeding 8 inches in loose thickness, uniformly moisture-conditioned, and compacted to achieve a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density. Non-expansive fill soils should be uniformly moisture conditioned to between 1 and 3 percentage points above the optimum moisture content. Fill soils composed of the native clays should be uniformly moisture conditioned to between 3 and 5 percentage points above the optimum moisture content. Additional fill lifts should not be placed if the previous lift did not meet the required relative compaction or if soil conditions are not stable. Discing, tilling, and/or blending may be required to uniformly moisture-condition soils used for engineered fill. The upper 12 inches of pavement subgrades should be compacted to at least 95 percent relative compaction by the CAL 216 test procedure.

1.5 Underground Utility Trenches

Pipe bedding should consist of sand with a sand equivalent of at least 30 or the pipe manufacturer's requirements, whichever is more restrictive. The pipe bedding should extend from 6 inches below the invert of the pipe to 1 foot above pipe the crown of the pipe. The pipe bedding material should be compacted to a minimum of 90 percent relative compaction or the manufacturer's recommendations if more stringent.

Trench backfill above the pipe bedding zone should be placed in the same manner as required in Engineered fill placement. On-site fill soils and “non-organic” native soils may be used as backfill in trenches above the pipe bedding. Utility trench backfill should be placed in layers not exceeding a loose lift thickness of 8 inches, uniformly moisture conditioned, and compacted to a minimum of 90 percent relative compaction.

Compaction criteria for trench backfill above the bedding zone may be decreased to 85 percent relative compaction in landscape areas at least 5 feet beyond structural improvements, except in areas overlain by pavements, sidewalks, or other hardscapes. In landscape areas overlain by pavements, sidewalks, or other hardscapes, we recommend that the trench backfill be compacted to a minimum of 90 percent relative compaction to within one foot of the finished subgrade surface. The upper 12 inches should be compacted to 95 percent relative compaction in areas to receive AC pavement.

1.6 Slabs on Grade

Exterior concrete slabs (i.e, sidewalks, concrete aprons, etc.) is to be constructed over 4 inches of Class 2 Aggregate Base over 12 inches of non-expansive engineered fill and is to be reinforced or jointed and scored to limit cracking from shrinkage. Some vertical offset should be anticipated for exterior concrete slabs constructed adjacent to irrigated landscaping, as the underlying native clay soils are later subject to cycles of drying/wetting.

1.7 Conclusion

The geotechnical engineer or qualified representative is to be on-site to observe and advise during site preparation, grading and earthwork, paving, and construction of foundations and slabs-on-grade. These observations should be supplemented with periodic density and compaction testing of subgrade and engineered fills to evaluate conformance with the recommendations contained in this report. It is important that foundation excavations be checked after cleaning and immediately prior to concrete placement to verify their suitability.